Understanding the adoption of soil and water conservation practices: The role of social capital

by

Elizabeth Musoke

MRCP, Kansas State University, 2012

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Environmental Design and Planning
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Abstract

Kenya has been adversely affected by soil erosion due to population growth, changes in land use and land cover, and unsustainable agricultural practices. Issues related to land degradation cost the Kenyan government approximately $390 million or 3 percent of the country's GDP yearly (Government of Kenya, 2013). Despite extensive land degradation, many attempts to encourage the use of soil and water conservation (SWC) practices have been unsuccessful. The study focuses on Merigi Ward, Kenya. Merigi Ward lies within the Mara River Basin (MRB), an ecologically and economically important river basin that has experienced extensive erosion problems. Increased agricultural activities driven by population growth in the area and changes in land use and land cover have degraded the landscape. SWC practices are greatly needed to mitigate the effects of erosion and conserve the natural resources within the MRB.

Past studies suggest that social capital may increase the adoption of SWC practices (Knowler & Bradshaw, 2007; Nyangena, 2008). This study defines social capital as the groups and networks, trust and reciprocity, formal and informal rules, and information that informs the interactions among persons that lead to collective action. Twenty-five smallholder farmers within Merigi Ward were interviewed and the relationship between the adoption of SWC practices and social capital was explored through a qualitative analysis. Additionally, the MRB is home to the Mau Mara Serengeti Sustainable Water Initiative (MaMaSe). The MaMaSe initiative is a public private partnership (P3) with the goal to promote sustainable water use, economic growth, and environmental conservation within the basin. The effect the MaMaSe initiative had on the level of social capital amongst the study participants was also investigated.

Findings suggest that social capital is an important aspect of SWC adoption in Merigi Ward. Groups and networks provide farmers with implementation support and information. Particularly, the local farmers' cooperative provides farmers with implementation assistance and links (bridging capital)

to experts at the MaMaSe initiative and the Ministry of Agriculture. Strong bonding capital works in the favor of this community allowing for high levels of trust. Thus, farmers collaborate to help one another implement practices and exchange information, materials, and experiences. In general, social capital has helped facilitate better environmental conservation awareness and the use of SWC practices. The largest impact the MaMaSe initiative had on the community's social capital was expanding networks (particularly bridging and linking capital) and providing in depth information and guidelines for SWC practice use. The P3 has also helped the farmers integrate environmental conservation into their daily lives and has helped promote a shared understanding of the importance of conservation. The findings of this study will help environmental conservation professionals understand how to use social capital to strengthen natural resource management.

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Approved by:

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Dr. Tim Keane

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Dedication

To the farmers of Merigi Ward, Kenya.

Chapter 1 - Introduction

Background

The United Nations Department of Economic and Social Affairs - Division of Sustainable Development (UN DESA - DSD) states most economies in Africa are heavily dependent on the agricultural sector (UN DESA-DSD, n.d.). Poverty eradication will depend on enhancing agricultural productivity and rural economies (UN DESA-DSD, n.d.). Agricultural progress, however, is hampered by severe land degradation (UN DESA-DSD, n.d.). Globally, the highest soil erosion rates are seen in Africa as well as Asia and South America (Barrow, 1991). To bring African countries out of poverty, soil degradation and loss must be addressed.

Kenya (Figure 1.1), a country in East Africa, has been adversely affected by soil erosion. Land and environmental degradation cost the Kenyan government USD 390 million or 3% of the country's GDP each year (Government of Kenya, 2013). The government also recognizes that land degradation is the source of socio-economic problems in the country (e.g. food insecurity, rural to urban migration) (Government of Kenya, 2013). There have been multiple initiatives introducing soil and water conservation (SWC) practices into Kenyan communities, but many attempts have failed (Nyangena, 2008). Thus, in this dissertation, I investigate how the adoption of soil and water conservation practices can be improved to reduce and reverse land degradation. Specifically, I explore how social capital influences the adoption of SWC practices.

Merigi Ward, a farming community that has experienced extensive erosion, was chosen as the focus of this study. Merigi Ward is located in the Mara River Basin. The Mara River Basin (MRB) has experienced environmental degradation due to land use and land cover changes and unsustainable land management practices (Defersha, Melesse, and McClain, 2012). The MRB is described in more detail

later in this chapter and Merigi Ward will be described in Chapter 3. To provide further context, the following section describes the environmental challenges Kenya has faced in recent years.

Figure 1.1 Location of Kenya (Data Source: Flannery, 2014)

Kenya's Struggle with Land Degradation

Kenya has had a long history of soil erosion that dates back to the 1930s (Thomas, 1997). The country's struggle with erosion still rages on today. One way to gain an understanding of Kenya's history with soil erosion is to look through past newspapers and news transcripts. News articles and transcripts were reviewed to observe the extent and management of soil erosion in recent years (1990 – 2016). News articles and transcripts were collected from LexisNexis® Academic through K-State Libraries using search terms "soil erosion + Kenya," "erosion control + Kenya" and "soil conservation + Kenya." At the time this dissertation was written, only articles and news transcripts from 1990 onwards were available. News articles and transcripts were chosen for further consideration if the article focused most of its content on Kenya and aspects of land degradation and soil erosion.

A predominant theme in the reviewed articles and transcripts is deforestation and acknowledgment of its damaging effects on Kenya's natural environment. Kenya's forests include

dryland forests, plantations, indigenous forests, farm forests, and montane forests (UNEP, 2012). Forests play a significant role in Kenya's economy by providing goods (i.e. wood and non-wood products) and regulating ecosystem services (UNEP, 2012). Kenya's montane forests, in particular, regulate the country's water resources including seasonal water flows in rivers (UNEP, 2012). The montane forests' total water yield is 15, 800 million cubic meters per year (m^3/yr) which accounts for more than 75% of the country's renewable surface water resources (UNEP, 2012). Losses in forest cover thus have direct and detrimental effects on water availability in the country. Between 2000 and 2010, Kenya's montane forests lost 50, 000ha and lessened the amount of available water by 62 million m^3/yr (UNEP, 2012). The quote below is from an article featured in Britain's Daily Telegraph and discusses Kenya's loss of forest cover and lack of rainfall in the early 2000s:

> Kenya lost more than 17,000 acres [6880ha] of forest cover between 2000 and 2003, drastically reducing the environment's natural moisture machinery and leading to the current spell of dismal rainfall. Soil erosion is also a problem. (Pflanz, 2006)

Forests have been cleared to support other land uses such as crop cultivation, charcoal production, grazing, quarrying and human settlements (UNEP, 2012). As a result of widespread deforestation calls for tree planting initiatives and reforestation have come from government officials, scientists, and activists. Notably, the late Nobel Laureate Wangari Maathai (a Kenyan environmental activist known for the Green Belt Movement) was a strong voice in both local and international media. In 2004, Maathai wrote an op-ed piece for the New York Times discussing the environmental changes that had occurred in Kenya due to deforestation:

> When I was growing up in Nyeri in central Kenya, there was no word for desert in my mother tongue, Kikuyu. Our land was fertile and forested. But today in Nyeri, as in much of Africa and the developing world, water sources have dried up, the soil is parched and unsuitable for growing food, and conflicts over land are common. (Maathai, 2004, p. 41)

The Mau Forest Complex is featured several times in the reviewed articles. According to the United Nations Environmental Programme (UNEP), the Mau Forest Complex spans approximately 400,000

hectares making it one of Kenya's largest forested areas (Nkako, Lambrechts, Gachanja, & Woodley, 2005). The Mau Forest is the source of several major rivers, including the Mara River (Nkako et al., 2005). The waters that flow from this montane forest are intricately linked to the function of critical industries including agriculture (Nkako et al., 2005). Deforestation of the Mau Forest has led to disruptions in the agricultural industry and other key sectors as evidenced in the following quote:

> More than a quarter of the 400,000-hectare forest has been lost because of human activity over the past 20 years, threatening Kenya's crucial tourism, tea, and energy sectors and the livelihoods of millions of people reliant on the Mau ecosystem. (Rice, 2009, p. 22)

The Kenyan government has set policies and partnered with local and international NGOs to support the country's environmental sustainability initiatives. Local volunteers and community groups have also contributed to reforestation efforts. The government has also engaged the military in its tree planting programs. In 2010, through a partnership between the Greenbelt Movement (Wangari Maathai's environmental organization) and the Kenya Forest Service, the Kenyan Armed Forces engaged in reforestation as part of strengthening the country's national security (Ongeri, 2010).

Some efforts, however, have caused more harm than good. Between the 1970s and 1980s, Kenya introduced *Prosopis juliflora*, a tree to help rehabilitate deforested areas and reduce soil erosion (Choge et al., 2002 cited in Mwangi & Swallow, 2005). The tree (locally known as Mathenge weed), however, is largely invasive and caused problems for some local communities (Mwangi & Swallow, 2005). In a more recent instance, a 2011 newspaper article wrote that the government was promoting the use of eucalyptus trees to increase forest cover:

> The government has launched guidelines aimed at helping in effective growing of the eucalyptus trees. Minister for Forestry Noah Wekesa launched the booklets at Kiawaithanji, in Tetu district yesterday. He said the booklets will improve the growing of eucalyptus leading to increased forest cover, carbon storage, and renewable energy and improved livelihood by creating wealth for the people. The government hopes to increase forest cover from two per cent to ten per cent by 2030. (Kanyi, 2011)

Eucalyptus, however, is not a native tree in Kenya and can cause problems in forests like the Mau (WREM International Inc, 2008). Eucalyptus can negatively impact the growth of slower growing, native tree species and can affect biodiversity (WREM International Inc., 2008). In addition to questionable policies and guidelines, people within the government itself are part of Kenya's environmental problems. Corrupt individuals in government positions have had a long history of exploiting their power to acquire land from forested areas. In her New York Times op-ed piece, Nobel Laureate Wangari Maathai described the corruption within the government:

> "In the 1970's and 1980's, as I was encouraging farmers to plant trees on their land, I also discovered that corrupt government agents were responsible for much of the deforestation by illegally selling off land and trees to well-connected developers." (Maathai, 2004, p.41)

In 2008, even a Member of Parliament (MP) admitted to the media that government agencies had played a role in the country's environmental degradation:

> The MP regretted that even government agencies like Kenya Tea Development Authority were getting firewood from indigenous trees in Mau. (BBC Monitoring Africa - Political, 2008)

Some communities have tried to take action against the government. In 2001, the Ogieks, an indigenous tribe native to the Mau Forest, held the Kenyan Government accountable over actions exacerbating the Mau's destruction. To the Ogiek, the Mau Forest is their ancestral home and is intricately linked to their culture and livelihood (WREM International Inc., 2008). More recently, local communities still feel sidelined and feel that they do not have a voice in conservation efforts. A 2014 article demonstrates the conflict between local communities and the Kenya Forest Service:

> There has been a raging tug-of -war between communities which live near the forests and KFS [Kenya Forest Service] over the management of forests. The communities argue that they should be involved in the conservation of forests, but KFS claims that instead of conserving the forest, the locals who live near the habitat have contributed to its destruction. (Matara,2014)

Deforestation has been tied to soil erosion. The Food and Agriculture Organization (FAO) states that deforestation leaves soil exposed to higher temperatures which cause a breakdown of organic

matter and increased evaporation leading to soil erosion (FAO, n.d.—a). Only approximately 7% of Kenya's land is suitable for arable farming, and the intensification of agriculture has led to communities clearing protected forests to expand agricultural activity (Cohen, Brown and Shepherd., 2006). These cleared lands become more vulnerable to soil erosion and the water cycle is disrupted. Furthermore, conservation practices have not been adequately implemented to mitigate the effect of agricultural practices on natural resources (Atisa, Bhat, & McClain, 2014).

To protect soil resources communities have been encouraged to integrate sustainable practices into agriculture to improve soil health and reduce erosion. Local newspapers feature articles written by scholars from various local universities providing advice on how to protect soil health. Newspaper articles have also featured communities and individuals who have taken the initiative to implement sustainable farming strategies on their own. Even with individuals and communities trying to reduce erosion, resistance to adopt improved sustainable practices is still an issue among farmers. A 2015 article documents the challenges associated with the adoption of conservation agriculture:

> It's been an uphill task to get a mind-set change for the farmers most of whom have always practised farming in the old way without regard of adopting better practices for higher yields. "The biggest challenge is a lot of farmers are very slow in adopting this practice. Many of them feel that they are being disturbed when we ask them to change their farming practices. But, as they catch up, they notice the advantages," Mr. Muli noted. (Mutegi, 2015)

Since, approximately 90% of Kenya's population rely on subsistence farming and livestock rearing (Cohen et al., 2006), it is imperative to find a way to help communities adopt more sustainable agricultural practices to protect Kenya's natural resources, especially, its forests. With the use of soil and water conservation practices, healthier soils can sustain crop productivity and the encroachment on forests can be minimized. The section below introduces the research questions that explore the complex challenge of understanding the adoption of SWC practices amongst smallholder farmers. Specifically, the influence of social capital on the adoption of SWC practices is addressed through the research questions.

Research Questions

While many variables including household and demographic characteristics have been studied in relation to the adoption of SWC practices, few variables have been determined to be consistent, universal predictors of adoption (Knowler & Bradshaw, 2007). Knowler & Bradshaw (2007), however, state that social capital could be a universal predictor of adoption and more research is required to determine its influence. Nyangena's (2008) quantitative study found that social capital does indeed play a role in the adoption of SWC practices in a Kenyan context. In addition to Nyangena's study, other scholars have also found social capital, or at least aspects of it, to have positive influences on the adoption of SWC practices (see Teshome, De Graaff, & Kassie, 2016a; Teshome, De Graaff, & Kessler, 2016b; Wossen, Berger, & Di Falco, 2015; Kassie, Teklewold, Jaleta, Marenya, & Erenstein, 2015; Njuki, Mapila, Zingore, & Delve 2008).

The concept of social capital has been explored in multiple fields using varying definitions. Onyx and Bullen (2000) draw from Portes (1998), Putnam (1993) and Woolcock (1998) stating that all definitions of social capital refer to the "networks of relationships between individuals and groups" (p. 24). My definition of social capital draws from the World Bank and a variety of scholars. It includes aspects or dimensions of social capital that facilitate collective action between individuals and groups. For this study, social capital is defined as the groups and networks, trust and reciprocity, formal and informal rules, and information that informs the interactions among persons that lead to collective action. Chapter two provides a more detailed discussion of social capital while chapter three presents how my definition was derived based on previous scholarly work.

Social capital has been cited as an important aspect of SWC practice adoption in recent African studies. Thus, in this dissertation, I investigate how social capital works to influence the adoption of SWC practices among smallholder farmers in Merigi Ward. The first research question is posed as follows:

1. How does social capital influence the adoption of soil and water conservation practices among smallholder farmers within Merigi Ward, Kenya?

For natural resource management to be effective, it is necessary for communities to work with other entities such as government, non-governmental organizations, and educational institutions to bring about positive change (Dale and Newman, 2010). The establishment of a public-private partnership (P3), the Mau Mara Serengeti Sustainable Water Initiative (MaMaSe), created to promote improved water safety and security in the Mara River Basin presented a unique opportunity to investigate how partnerships can affect the level of social capital and improve natural resource management. The MaMaSe initiative is a four-year program (started in 2014) led by UNESCO's IHE Delft Institute for Water Education (MaMaSe, 2016a). The Institute provides graduate education and engages in research and capacity development projects related to water engineering, water management, environment, sanitation and government (IHE Delft, n.d.). The other partners include:

- **Embassy of the Kingdom of the Netherlands -**As well as consular activities, embassies of the Netherlands are involved in development cooperation, political affairs, press and cultural affairs, and economic affairs (Government of the Netherlands, n.d.). The Netherlands Embassy in Nairobi, Kenya provides financial support for the MaMaSe initiative (MaMaSe, 2016b).
- **Water Resources Management Authority (WRMA)** – The lead Kenyan government agency that manages and regulates water resources at the national level. (Water Resources Management Authority, 2017)
- **SNV Netherlands Development Organization (SNV)** - Founded in 1965, SNV is an international development nonprofit that works to alleviate poverty around the world. Their work focuses on agriculture, energy, water, sanitation, and hygiene. (SNV, 2017)

- **World Wildlife Fund Kenya (WWF Kenya)** – World Wildlife Fund works across communities, public and private sectors to improve environmental conservation. WWF Kenya is an arm of the main organization. (World Wildlife Fund, 2017)
- **Wageningen University & Research (Wageningen UR)** – Wageningen UR is a university located in the Netherlands. Wageningen UR is a partnership between Wageningen University and Wageningen Research Foundation. Their research is focused on three main areas: (1) food and food production, (2) living environment and health and (3) lifestyle and livelihood. (Wageningen University & Research, n.d.)
- **Egerton University** – Founded in 1939, Egerton is a Kenyan public agricultural university. Colleges include: Agriculture, Arts and Social Sciences, Education and Community Studies, Engineering and Technology, Environment and Resources Development, and Science and Veterinary Medicine and Surgery. (Egerton University, 2015)
- **Maasai Mara University** – A Kenyan university focused on research and outreach. Their mission includes contributing to environmental conservation. (Maasai Mara University, 2016)
- **Mara River Water Users Association (MRWUA)** – A community-based organization committed to protecting the water resources within the Mara River Basin. (Equator Initiative, 2017)
- **Deltares –** An independent institute focused on applied research related to water resources. Focus areas include flood risk, adaptive delta planning, infrastructure, water & subsoil resources and environment. (Deltares, n.d.)
- **GIZ –** A German development agency focused on international cooperation. They provide services related to economic development, environment, and energy, to name a few. Their mission encourages sustainable development. (GIZ, n.d.)

- **Mara Farming –** A Kenyan vegetable produce company focused on profits and improving farmer economic well-being. (Lobelle & Waardenburg, 2016)
- **Waterschap Brabantse Delta –** A Dutch water company focused on monitoring water quality and quantity in central and western Brabant. (Waterschap Brabantse Delta, n.d.)
- **HSBC –** A global banking and financial services organization. (HSBC Bank, 2017)
- **ITC - University of Twente:** ITC is the Faculty (College) of Geo-Information Science and Earth Observation at the University of Twente. The faculty is focused on enhancing teaching, research and capacity development. (University of Twente – ITC, n.d.)

The MaMaSe initiative programs are divided into five result areas (MaMaSe, 2015). The second result area is focused on promoting "market driven wise water agricultural development and forest conservation in the upper Mara River Basin," (MaMaSe, 2015, para 3). The focus of my dissertation pertains to the activities conducted in result area two. Of the partners listed above, three are working in this second result area: SNV, Wageningen UR and WWF Kenya (SNV staff member, personal communication, February 7th, 2017). The roles of each partner are described as follows:

- **SNV** – SNV's focus is on economic development and climate smart agricultural programs that focus on market-driven development. Essentially, SNV was interested in understanding how the market could trigger development in agriculture and focused their efforts on connecting smallholder farms to market opportunities while emphasizing environmental conservation. (SNV staff member, personal communication, February 7th, 2017)
- **Wageningen UR** – Researchers at the Wageningen Environmental Research Institute, also known as the Alterra Institute, were focused on providing recommendations for reducing degradation in the upper Mara River Basin. They provided technical research as well as monitoring and evaluation and information sharing services (SNV staff member, personal communication, February 7th, 2017)

- **WWF Kenya** – WWF Kenya has been working in the Mara River Basin for several years. Their expertise was used to understand what types of conservation efforts would fit best within the area. (SNV staff member, personal communication, February 7th, 2017)

One of the objectives of this dissertation is to understand how the level of social capital could be affected by partnerships, specifically, the presence of a P3 focused on promoting sustainable development. Therefore, the second research question looked to investigate the MaMaSe initiative and its effect on social capital:

2. How does the MaMaSe initiative influence the level of social capital among smallholder farmers within Merigi Ward, Kenya?

Methods

Studies investigating the adoption of SWC practices in Africa have generally used a quantitative approach with the main goal of observing the statistical significance of variables. Chapter two provides a detailed review of these quantitative studies. Quantitative approaches offer insight into adoption processes but may miss details that are better captured through a historical or qualitative case study approach (Barrett, Place & Aboud, 2002). Qualitative methods can tease out the social and cultural aspects that influence adoption which cannot be observed in quantitative analyses (Barrett et al., 2002). Furthermore, qualitative approaches can better capture the complex decision-making processes at different scales (i.e. plot, farm or community levels) (Barrett et al., 2002). Thus, a qualitative case study approach was well suited to understand how social capital influences adoption and how P3s affect social capital amongst smallholder farmers.

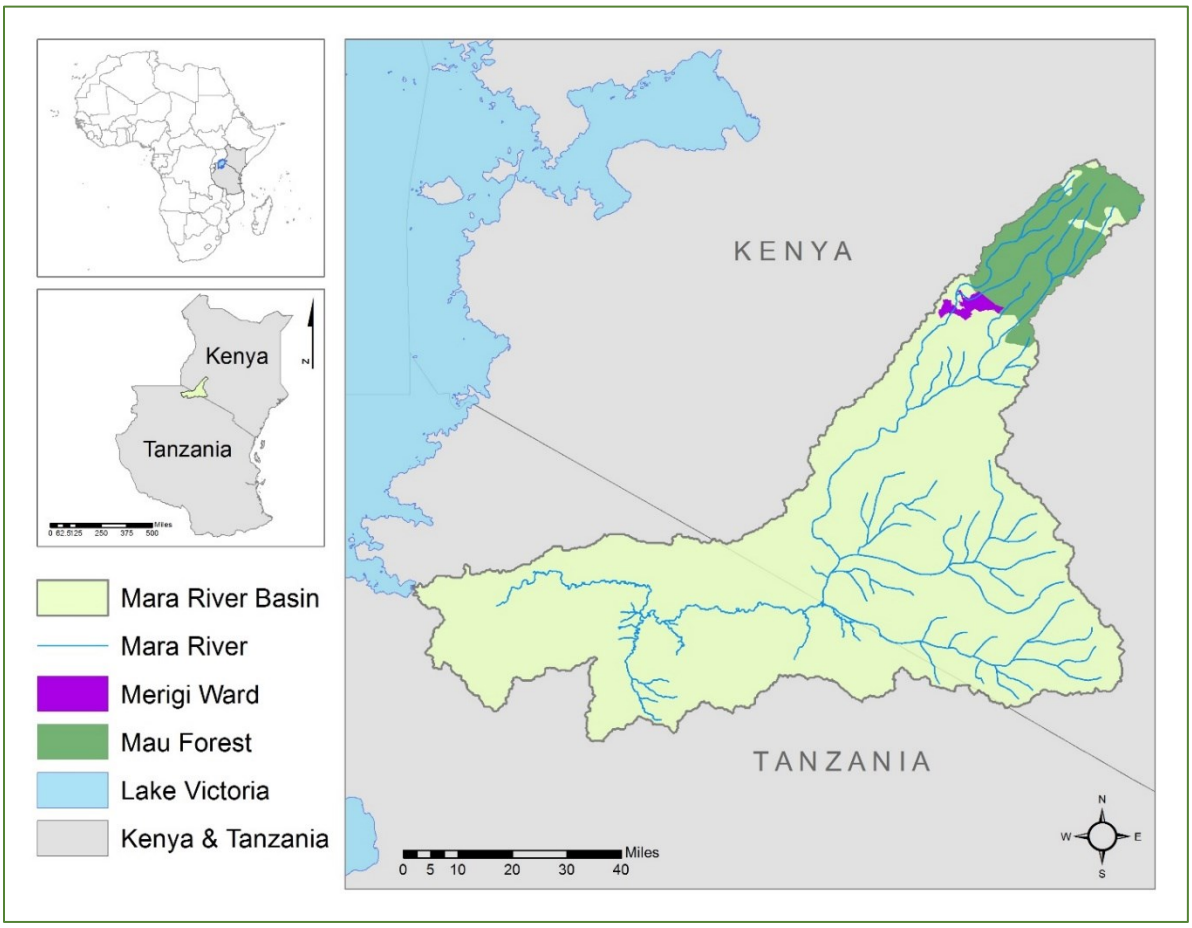
Semi-structured face to face interviews were used to collect data. Smallholder farmers, WWF Kenya staff, and SNV staff were chosen as study participants. Twenty-five smallholder farmers were asked about their past and current use of SWC practices, their ability to access social capital within their

community and their interaction with the MaMaSe initiative. Only smallholder farmers who had adopted SWC practices were selected for the interview to better understand social capital's influence on adoption. A short survey collected demographic data, household characteristics, and farm plot characteristics. Skype interviews were conducted with key staff members from both WWF Kenya and SNV. Staff members were asked to speak about their organization's role in the MaMaSe initiative and aspects of soil conservation and social capital.

Study Area: The Mara River Basin

As implied by the reviewed news excerpts in the previous section, the Mau Forest Complex is a critical ecosystem in Kenya. One of the main rivers that emerges from the Mau Forest is the Mara River, which forms the Mara River Basin (MRB) (Figure 1.2). The MRB is a transboundary watershed shared by Kenya and Tanzania. It spans approximately 13,750 km^2 (Onyando, Agol, & Onyango, 2013). The majority of the basin, 65%, lies on the Kenyan side while 35% continues into Tanzania (Onyando et al., 2013). The MRB features two of the most famous wild game reserves in the world: the Serengeti and the Maasai Mara which attract many tourists each year. The basin also supports the lives and livelihoods of approximately 1.1 million Kenyan and Tanzanian residents (WREM International Inc, 2008). Roughly 750,000 people live on the Kenyan side of the basin (WREM International Inc, 2008).

Figure 1.2 Location of the Mara River Basin (Data sources: Van Der Kwast, 2014; Hamilton, 2016; Flannery, 2014; OCHA – ROSEA, 2012; Josiah, 2015; ILRI GIS Services, 2007; Tedrick, 2013)



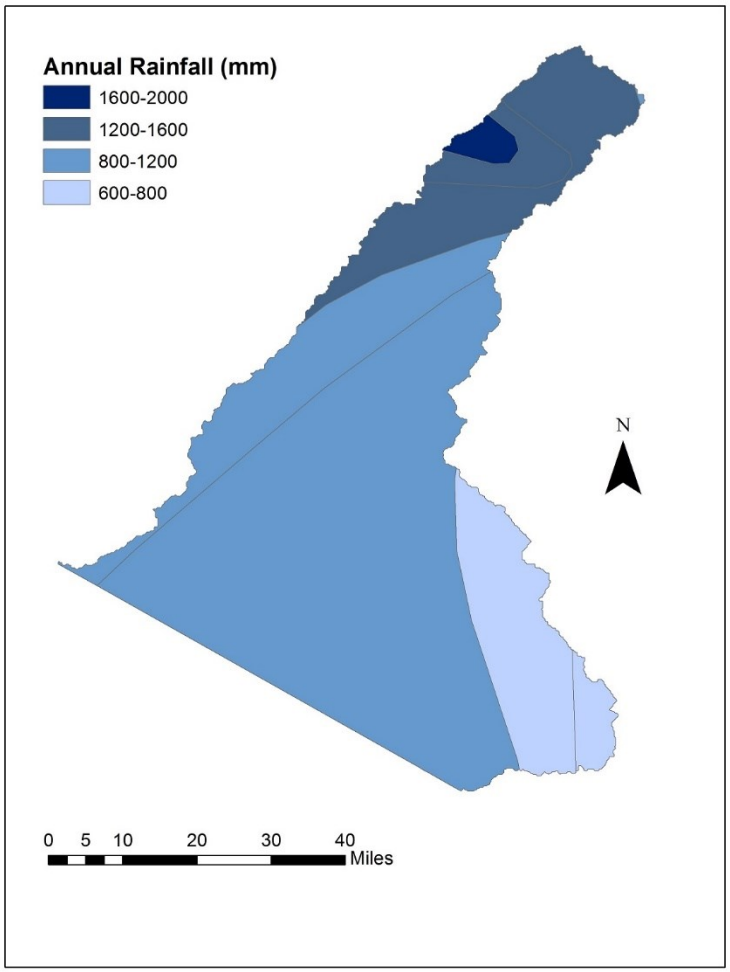
Population growth and agricultural practices have contributed to severe soil erosion leading to the degradation of land and water resources in the basin (Atisa, et al., 2014; Negussie, Urbaniak, & Zalewski, 2011). Erosion rates are particularly high in the upper catchment where the Mau Forest is located (Defersha et al., 2012; Defersha and Melesse, 2012; Mati, Mutie, Gadain, Home, & Mtalo, 2008). This degradation poses a major problem not only to the people and wildlife residing in the basin but other countries as well. The MRB drains into Lake Victoria, which provides several socioeconomic benefits to the entire East African region and beyond. The following paragraphs provide a brief overview of the climate, hydrology, soils and land use

of the MRB. The data collection site, Merigi Ward, is located in the upper MRB. It will be described in more detail in Chapter Three.

Climate

Most of the MRB is in a semi-arid region (WREM International Inc, 2008). However, rainfall and temperature are highly variable within the basin (WREM International Inc, 2008). Rainfall patterns are controlled by the Intertropical Convergence Zone (ITCZ) (Dessu & Melesse, 2013). The ITCZ drives the basin's bimodal rainfall seasons (Dessu & Melesse, 2013). The short rains occur from October to December while the long rains return in March and continue through May (Dessu & Melesse, 2013). The Mau Forest, in the northern tip of the basin, has a more unimodal rainfall pattern with the highest rainfall occurring between April and August (WREM International Inc, 2008). Annual rainfall totals (Figure 1.3) vary widely within the basin due to varying landforms including hilly areas and vast plains (WREM International Inc, 2008). In the upper reaches of the basin annual rainfall totals range from 1000mm to 1750mm; rainfall in the middle part of the basin totals 900mm to 1000mm and rainfall in the lower reaches range from 300mm to 850mm (Dessu & Melesse, 2013). On the Kenyan side, temperatures are cooler in the highlands and increase towards the southern parts of the basin as the altitude drops (WREM International Inc, 2008). The annual average temperature is 25°C (77°F) (WREM, 2008). On the Tanzanian side of the basin, the annual average temperature is about 23°C (WREM International Inc, 2008). Data relating to temperature, solar radiation, and wind speed is scarce due to the lack of monitoring stations (WREM International Inc, 2008).

Figure 1.3 Annual rainfall in the upper Mara River Basin (Data Source: ILRI GIS Services, 2007)



Hydrology

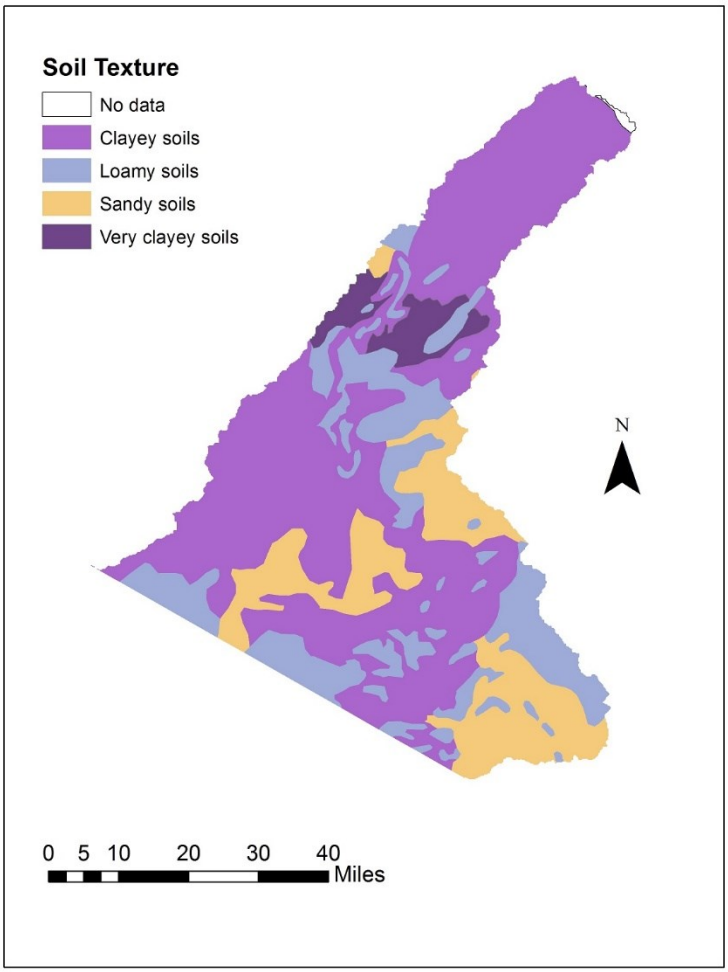
The Mara River is the only perennial river within the basin (Mango, Melesse, McClain, Gann, and Setegn, 2011). It begins at the confluence of the Amala and Nyangores rivers whose headwaters form in the Mau Forest (Mango et al., 2011). The Mau Forest is considered one of Kenya's five "water towers" (Akotsi, Gachanja, and Ndirangu, 2006). Water towers are forests that form the upper catchments of the main rivers in Kenya. The towers are vital to the country's key economic sectors i.e. energy (hydroelectric power), water, agriculture and tourism (Akotsi et al., 2006). The Mara River and its

tributaries (see Figure 1.2 above) are particularly important to Kenya's tourism and agricultural sectors (Dessu, Melesse, Bhat, & McClain, 2014). Expansive wetlands lie at the mouth of the Mara River in Tanzania (Mati et al., 2008). The wetlands have been adversely affected by changes in land use in the upper catchments (Mati et al., 2008). Increased sediment build up from erosion in the upper reaches has driven the expansion of these wetlands (Mati et al., 2008). In some areas, locals have expressed that people and livestock have been driven out due to waterlogging from expanding wetlands (Mati et al., 2008).

Soils

Typically, the parent material of most Kenyan soils is volcanic rock (WREM International Inc, 2008). The soils on the Kenyan side of the MRB, however, are variable. Soils in the Mau Forest are formed from crystalline bedrock (WREM International Inc, 2008). Alluvial soils are found along the Mara River and in the middle section of the basin (WREM International Inc, 2008). Soils on the Tanzanian side of the basin are formed from dark gray basalt (WREM International Inc, 2008). Soil colors range from reddish brown in the upper basin to gray, black soils in the lower basin (WREM International Inc, 2008). The soils are classified as moderately deep or deep with generally good drainage (WREM International Inc, 2008). Overall, the soils within the basin are fertile and can support a broad range of agricultural activities (WREM International Inc, 2008). The Tanzanian soils are particularly well suited to support the savannah ecosystem of the Serengeti (WREM International Inc, 2008). Figure 1.4 maps the different soil textures found on the Kenyan side of the basin.

Figure 1.4 Soil textures in the upper Mara Rivers Basin (Data Source: ILRI GIS Services, 2007)



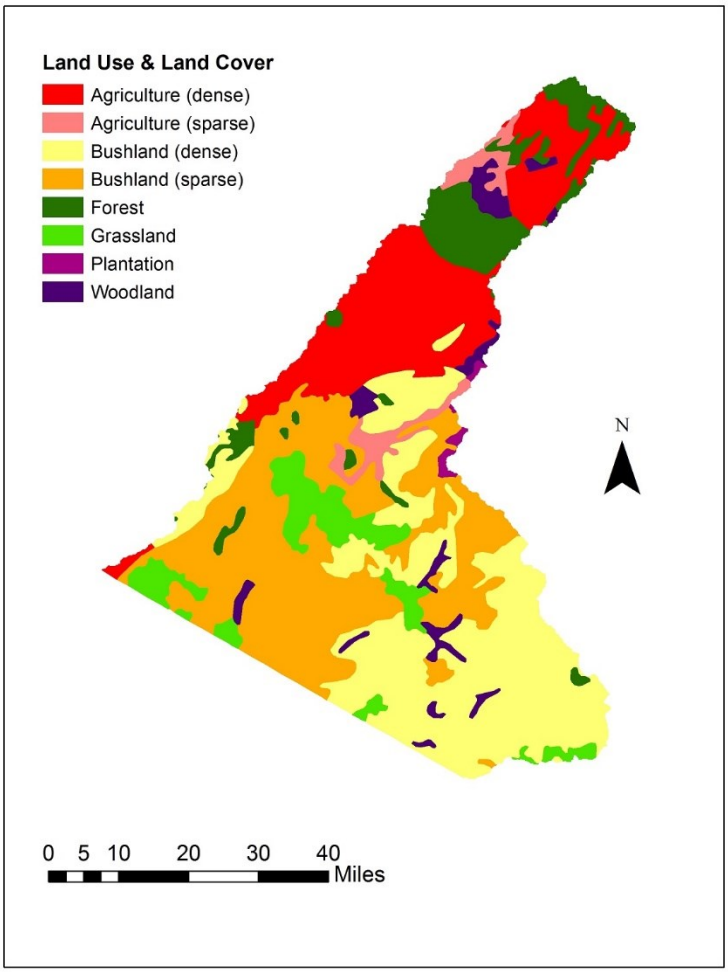
Land Use

The northern section of the basin consists of the Mau Forest Complex (WREM International Inc, 2008). Even though the Mau Forest is meant to be a preserve, illegal settlements can be found within its boundaries. Agriculture is practiced on the land just south of the Mau Forest. Krhoda (n.d.) estimated that there are 32,000 hectares (ha) of land available within the entire basin for upland crops. Within the upper MRB, large-scale commercial farming and smallholder mixed farming are the main two agricultural types (Hoffman, Melesse, & McClain, 2011). Within the MRB, 62% of households are

smallholder farmers (WREM International Inc, 2008). Smallholder farmers are considered to have land between two and five ha in size (WREM International Inc, 2008; Onjala, 2004; Krhoda, n.d.). Large-scale farms are considered 50 ha or larger (WREM International Inc, 2008). Large-scale commercial farms grow barley, pyrethrum, maize, wheat, sunflowers, onions, tomatoes, citrus fruits, sugarcane, coffee and tea (Onjala, 2004; WREM International Inc, 2008). Smallholder farms grow maize, wheat, beans and a variety of vegetables and mostly practice subsistence farming (Onjala, 2004). Tea is also grown by smallholder farmers (WREM International Inc, 2008). Regarding irrigated land, Hoffman et al. (2011) states that most smallholder farmers in the basin typically do not use irrigation and rely on rain-fed agricultural practices. Some large-scale farms use center pivot irrigation (Hoffman et al., 2011). The lower sections of the MRB on the Kenyan side consist of grasslands used for grazing. A vast expanse of the grasslands is reserved for wild game through the Maasai Mara Game Reserve (WREM International Inc, 2008). Figure 1.5 shows the approximate land use and land cover distribution in the upper MRB.

The Tanzanian side of the basin consists of the Serengeti Game Reserve, but the most notable land use is small scale agriculture growing maize, beans, and sorghum (WREM International Inc, 2008). The area also contains 20% of Tanzania's livestock (WREM International Inc, 2008). Studies have shown that agricultural land has the highest erosion rates in the MRB (Defersha and Melesse, 2012; Defersha et al., 2012).

Figure 1.5 Approximate land use and land cover distribution in the upper Mara River Basin (Data Source: ILRI GIS Services, 2007)



Study Significance and Objectives

The inspiration for this dissertation stemmed from the need to provide Kenya with research that can help practitioners (local government, extension agents, NGOs, local associations etc.) improve the implementation of soil and water conservation (SWC) practices in communities around Kenya. For this study, an SWC practice is defined as any modification to the land or any action intended to reduce soil erosion. Soil and water conservation practices include (but are not limited to): terracing, grass strips, agroforestry, no till agriculture, and soil bunds.

The first broad objective is to better understand how social capital within communities can be used to foster better natural resource management. The second objective is to observe how a P3, like the MaMaSe initiative, could successfully strengthen social capital and be a model that can be adapted to other areas of the country.

This work will add to the literature by providing further insight into the role of social capital on the adoption of these much-needed practices. Few studies have explored the adoption of SWC practices in Kenya, and even fewer studies have investigated the influence of social capital on adoption in a Kenyan context. Additionally, assessing how a public-private partnership can affect social capital within a community can help us understand how better to use partnerships to create beneficial outcomes in natural resource management.

Structure of the Dissertation

Chapter One (above) details Kenya's struggle with land degradation and the need for soil and water conservation practices. An overview of the dissertation's study significance, study objectives, research questions, methods and general study area is also described in this first chapter. Chapter Two consists of an in-depth literature review detailing Kenya's history of soil erosion, a review of SWC practice adoption studies in Africa, a discussion of social capital and its relation to sustainable development and natural resource management, and lastly, the importance of partnerships in sustainable development. The third chapter provides a detailed description of the data collection site, Merigi Ward, and describes the methods used for data collection and analysis. Chapter Four reports the results of the data analysis. The fifth and final chapter provides a summary of the research conducted and discusses the results of the data analysis in terms of the two research questions. Generalizability of the study, critical reflexivity, recommendations for future research and implications for practice and policy, are also discussed in this last chapter.

Chapter 2 - Literature Review

A Brief History of Soil Erosion and Conservation Policies in Kenya

To understand Kenya's present environmental degradation, it is important to look at the country's past relationship with the environment and policy development. Erosion was recognized as a major problem in 1930 when the British colonial government began the Soil Conservation Service to tackle widespread land degradation (Thomas, 1997). The colonial government initially introduced cross slope barriers (Figure 2.1) such as vegetative strips (Thomas, 1997). But with increased population growth and more intensive use of the land, the government introduced more stringent policies that involved the use of terracing, planting trees in steep areas, discouraging tree cutting and discouraging cultivation along riparian areas (Thomas, 1997). One of the policies introduced was the Swynnerton Plan, which looked to improve the production capability of African farmers and thus improve Kenya's economy through intensive farming and conservation efforts (Thomas, 1997).

Figure 2.1 Examples of cross slope soil and water conservation practices (Photo by Author)

Trench or Ditch

Grass Strip

Those who did not comply with the soil erosion reduction efforts were punished by agricultural extension workers and other administrative officers (Thomas, 1997). Once Kenya's struggle for independence began, conservation efforts were abandoned (Thomas, 1997). By 1961, farmers turned their attention to political activities, and political activists encouraged farmers not to engage in erosion control practices as soil conservation was negatively associated with the colonialists (Thomas, 1997).

After the country's independence in 1963, farmers were encouraged to continue large-scale agricultural activities (Mutisya, Zejiao, and Juma, 2010). Soil conservation, however, was not promoted as it was still associated with colonialism (Mutisya et al., 2010). Food crops (millet, ground nuts, fruit, and maize) and cash crops (tea, tobacco) were widely produced (Mutisya et al., 2010). To accommodate a growing population, forests were cleared to support intensified agriculture (Mutisya et al., 2010). It was not until the 1970s that the Kenyan government began to see the effects of widespread environmental degradation. With extensive overgrazing and soil erosion, soil fertility began to decline, and in turn, so did agricultural production leading to decreased household incomes throughout the country (Mutisya et al., 2010).

In 1974 the National Soil and Water Conservation Project (NSWCP) was founded. It spanned approximately 20 years ending in 1994 (Mutisya et al., 2010). NSWCP, funded by the Government of Kenya and the Swedish International Development Agency (SIDA), was created to improve soil fertility and raise the standard of living through soil conservation practices (Mutisya et al., 2010).

The the fanya-juu terrace was widely promoted for soil conservation. A form of this type of terracing, the fanya chini terrace, is discussed further in Chapter Four. Other promoted practices included grass strips, river bank protection, and controlled grazing (Mutisya et al., 2010). The Catchment Approach (CA) developed out of NSWCP in the late 1980s (Mutisya et al., 2010). CA essentially organized one or two villages by hydrological watersheds (or catchment areas) and strategies were developed and implemented within this defined unit (Mutisya et al., 2010). Each catchment area included

approximately 200 farmers (Mutisya et al., 2010). Catchments were provided with equipment and resources to carry out sustainable farming practices (Mutisya et al., 2010). In the end, NSWCP was not sustainable because community activities could not be supported without the free farm tools provided by the program and once donor support ended NSWCP projects began to collapse (Mutisya et al., 2010).

In 2001, the National Agricultural and Livestock Extension Program (NALEP) was formed (IFPRI, n.d.). NALEP's objective is:

> "to enhance the contribution of agriculture to social and economic development and poverty alleviation through institutionalization of demand driven and farmer-led extension services, increased effectiveness of pluralistic provision of extension services and increased participation of [the] private sector in providing extension services" (Mutisya et al., 2010, p. 10).

NALEP, however, has come under scrutiny for its vague explanation of what roles the various extension actors play (IFPRI, n.d.). Traditionally, extension was provided by the government and by commodity based extension services (IFPRI, n.d.). However, the failure of government and commodity based extension services led to the formation of other options (IFPRI, n.d.). Extension services in Kenya now include private companies, non-governmental organizations, and faith-based or community-based organizations (IFPRI, n.d.).

While there have been various programs and initiatives since the 1970s, Kenya has not had a consistent and supported national program for soil conservation. Most recently, the National Environment Policy recognizes the importance of soil conservation and has plans to create a national soil policy and program (Ministry of Environment, Water and Natural Resources, 2013). Kenya's 2013 National Land Reclamation Policy states that many of Kenya's policies and guidelines (i.e. Agricultural Act, Environmental Management and Coordination Act of 1999, Forest Policy and Forest Act of 2005, National Policy for the Sustainable Development of Arid and Semi-Arid Lands of Kenya of 2012) have inadequately prescribed specific provisions that address how to improve degraded land (Ministry of Water and Irrigation, 2013). From my review, the Land Reclamation Policy itself still needs to provide

specific actions or strategies to guide the implementation of the policy's goals. For example, concerning degraded lands the policy states that the government will:

- Identify and map all degraded lands and place them under a reclamation program.
- Integrate the use of improved indigenous knowledge and latest research to manage degraded areas.
- Create an enabling environment for active participation of all stakeholders including the private sector in determination and reclamation of such lands.
- Develop rules and regulations to ensure disturbed lands are reclaimed.

(Ministry of Water and Irrigation, 2013, p. 28)

The policy statements above are broad and need further detail to aid in how these directives will be implemented. Similarly, the Population Policy for National Development recognizes the connection between population growth and environmental sustainability, but again the measures remain broad with no level of detail as to how the policy will be implemented.

All of Kenya's policies are meant to align with Vision 2030, Kenya's long-term national development plan. Vision 2030 was launched in 2008 to address Kenya's social, economic and environmental development. In successive five-year increments (known as medium term plans) until 2030, a variety of projects have been designed to enhance Kenya's prosperity and growth (Government of Kenya, 2013). The second medium-term plan spanning from 2013 -2017 states that the country's policies will be revised and finalized including the national environmental policy. There is no specific mention of a national soil conservation policy in the Vision 2030 plan even though the 2013 National Environment Policy states that one will be created.

Policies in Kenya are still undergoing development and continuous review by a variety of entities within the government. With no specific measures outlined for soil conservation as of yet, this dissertation research will be helpful in the formulation of detailed local policies that could be scaled up to regional and national levels. Specifically, potential policies formulated to harness social capital so that communities effectively work together to prevent soil erosion as well as specific policies that enable the formation of partnerships between communities and other entities.

Overview of soil erosion challenges in the Mara River Basin

Population growth and subsequent land use changes have significantly affected the natural systems of the Mara River Basin (MRB) (Defersha et al., 2012). Using remote sensing techniques, numerous studies have documented land use and land cover (LU/LC) changes and consequences in the MRB and similar areas around Kenya (Baldyga, Miller, Driese, and Gichaba, 2008; Erdogan, Pellikka, and Clark, 2011; Were, Dick, and Singh, 2013; Serneels, Said, and Lambin, 2001). Baldyga et al. (2008) assessed land cover changes in the Mau Forest over a period of 17 years (1986 to 2003). Significant changes were observed after 1995, with forest cover being converted to mixed grasses and small-scale agriculture (Baldyga et al., 2008). Were et al. (2013) studied the Eastern Mau Forest and the Lake Nakuru Basin (just north of the MRB) and found that the area of cropland has increased at an average annual rate of 6% while forest-shrublands and grasslands have each decreased at a rate of 1% annually from 1973 to 2011.

Modeling the effects of LU/LC changes using computer modeling software such as the Soil and Water Assessment Tool (SWAT) (Neitsch et al., 2002) and other programs can add a layer of detail to remotely sensed data. The use of these models allows researchers to assess how LU/LC changes can affect hydrology. Baker and Miller (2013) studied the River Njoro watershed which lies in proximity to the MRB. Using the Automated Geospatial Watershed Assessment (AGWA) (Miller et al., 2007) tool, Baker and Miller (2013) determined that “a higher proportion of rainfall is being converted into surface runoff, rather than infiltrating into the soil and recharging the regional aquifer” (p. 109). Defersha et al. (2012) investigated hydrological changes and soil erosion rates in the upper MRB using Water Erosion Prediction Project (WEPP) modeling (Flanagan, Ascough II, Nearing, & Laflen, 2001) and Erosion 2D/3D modeling (Schmidt, von Werner, and Michael, 1999). The models showed an increase in surface runoff in areas where forest and grassland had been converted to agricultural land (Defersha et al., 2012). The highest erosion rates in the basin were generally on cultivated land (Defersha et al., 2012). Figure 2.2

shows soil loss on a farm in Merigi Ward. The owner of the farm explained that runoff produced from recent rains had caused erosion on his land.

Figure 2.2 Evidence of soil loss on a farm in Merigi Ward (Source: Photo by Author)

Another study modeled how the Mara River would be affected by increased conversion of forest to agricultural land coupled with projected climate change (Mango et al., 2011). The study found under all land use change scenarios, base flow and average flow of the Mara River reduced while peak flow increased (Mango et al., 2011). Regarding climate change, Mango et al. (2011) concluded: "accompanying increases in evapotranspiration, driven by rising temperature, will limit increases in aquifer recharge," (p. 2257). Dessu and Melesse's (2013) study on climate change effects in the MRB concurs with Mango et al. (2011) stating that extreme high flows and low flows will be present due to wet seasons becoming wetter and dry seasons becoming drier.

Defersha and Melesse (2012) combined field scale experiments and modeling to estimate sediment yield in the upper sub-basins of the MRB. Findings from their field scale experiments indicate

that agricultural fields produced the most sediment. They measured 162.38 g/m2 sediment yield from agricultural field plots compared to 29.95 g/m2 of sediment measured from grassland plots (Defersha and Melesse, 2012). Increased erosion, due to LU/LC changes in the upper areas of the basin, has detrimental effects on the hydrology downstream where the basin extends into Tanzania (Mati et al., 2008). Mati et al.'s (2008) investigation found that the wetlands in the lower MRB basin have been increasing in area. The expansion of these wetlands is due to backwater flow from Lake Victoria (Mati et al., 2008). This backwater flow is caused by the accumulation of sediment which has been carried downstream from eroding lands in the upper MRB (Mati et al., 2008).

Increased sediment yield also affects human health. Ngugi, Home, and Mutwiwa (2014) found increased sediment in water samples taken at water collections points within the basin. The study attributes increased sediment to soil erosion from livestock overcrowding the water points as well as other human activities (Ngugi et al., 2014). Water demand will also be affected by increased population and continual conversion of lands for agricultural practices (Dessu et al., 2014). Dessu et al. (2014) call for more sustainable farming practices stating, "With the current trend of traditional farming practices, the basin may continue to experience severe water shortage[s]" (p. 113).

There is a definite need to adapt farming practices to protect the water and soil resources in the basin, and thus SWC practices play a vital role in the area. Few studies have assessed the adoption of SWC practices in Kenya, and even fewer studies have been conducted in the Mara River Basin. The next section details SWC practice adoption studies conducted throughout Africa including Kenya.

Adoption of Soil and Water Conservation Practices: Trends & Conclusions in Peer-reviewed Literature

Soil and water conservation practices have been used around the world to mitigate the effects of soil erosion and prevent further land degradation. Soil and water conservation practices include (but

are not limited to): terracing, grass strips, agroforestry, no till agriculture, and soil bunds. For this study, an SWC practice is defined as any modification to the land or any action intended to reduce soil erosion. Nyssen et al., (2008) studied the effect of soil erosion controls in the Tigray highlands of Ethiopia over a 30-year period. They concluded that soil erosion controls were indeed effective in reducing soil loss and improving the landscape (Nyssen et al., 2008). Nyssen et al., (2008) state that their study disagrees with the hypothesis that land degradation is irreversible and SWC programs are ineffective. Additionally, SWC practices have been found to improve crop yields and soil fertility (Sawadogo, 2011) which can lead to improved profits for farmers (Teshome, Rolker, and de Graaff, 2013).

Though there are clear benefits of SWC practices, there are also associated downfalls. Hengsdijk, Meijerink, and Mosugu (2005) studied the performance of soil bunds, contour terraces and reforestation in Ethiopia finding that the short-term benefits were limited. In another study, production did not increase within the first three to five years of implementing SWC practices (Herweg and Ludi, 1999). Herweg and Ludi (1999) state that farmers are concerned with their immediate well-being and that of their families: "For the farmers, however, what counts is production, and for the subsistence farmers it is mainly the production of the current season that guarantees the mere survival of their families" (p. 112). When farmers in the study were informally asked about SWC practices, they stated that SWC practices required intensive labor, took up land that could be used for crops, disrupted traditional farm operations among other constraints (Herweg and Ludi, 1999). It is thus essential to understand what may be preventing the adoption of SWC practices to find solutions and improve adoption.

Soil conservation management should also consider farmer perception of problems, priorities, factors that influence decisions, and indigenous knowledge (Amsalu & de Graaff, 2006). In Africa, farmers are generally aware of soil erosion and its associated problems (Moges & Holden, 2007; Okoba & de Graaff, 2005). Mekuria et al. (2009) found that Ethiopian farmers in the Tigray Highlands region

understood the link between soil erosion and low agricultural production as well as the relationship between land use change and erosion. Similarly, Biratu & Asmamaw (2016) found that the majority of farmers in another region of Ethiopia recognized that soil erosion was a problem on their farmland: "Farmers were able to identify indicators of soil erosion that are relevant, and sufficiently express the degree and the nature of the problems in their area" (p. 7). Negatu & Parikh (1999) found that perception had a significant effect on the adoption of SWC practices, concluding that there is a reciprocal reaction between perception and adoption among farmers in Ethiopia. Wildemeersch et al. (2015) underscore the importance of perception in their study finding that adopters of SWC practices in Niger are overall more aware of soil erosion and its processes. Wildemeersch et al. (2015) point out, however, that there were farmers in their study that attributed a decrease in soil quality to superstitions or God. Okoba & de Graaff (2005) observed that farmers in the Central Highlands of Kenya were aware of soil erosion and erosion controls, but the farmers did not perceive that SWC practices prevent erosion.

Understanding farmer perception helps conservation practitioners develop more culturally appropriate and context-specific strategies. Additionally, the literature demonstrates that it is important to take into consideration that farmers are looking for a way to improve their lives and that of their families (de Graaff et al., 2008; Tefera & Sterk, 2010; Thorlakson, Neufeldt, & Dutilleul, 2012; Greiner & Gregg, 2011). Farmer perception of erosion among SWC adopters in Merigi Ward will be assessed to understand how soil erosion and SWC practices are perceived in the community.

Aside from perception, many variables have been studied to observe their influence on the adoption of SWC practices. Table 2.1 displays selected adoption studies conducted in Africa and some of the most common variables included in those studies. Depending on the study's context, Table 2.1 demonstrates that a variable may be positively significant in one community but negative in another. For example, the variable off-farm income (referring to farmers whose livelihood is not wholly

dependent on farm activities) is seen to be both significantly positive and negative and even insignificant in some studies. Tenge, De Graaff, and Hella (2004) found that Tanzanian farmers who participated in off-farm activities were less likely to take part in adopting SWC practices due to the competition of labor between the two. Additionally, more short-term benefits can be gained from off-farm endeavors compared to participating in SWC activities (Tenge et al., 2004). In contrast, Teklewold & Koehlin (2011) found that off-farm income positively affected adoption among Ethiopian farmers as it can contribute to the money lost when investing in SWC practices.

Knowler and Bradshaw (2007) performed a meta-analysis of agricultural conservation practices around the globe. They concluded that few variables had been found to be consistent predictors of adoption (Knowler and Bradshaw, 2007). The study states that though there are no universal indicators that predict adoption, social capital may show some promise: "… further research into the influence of social capital on conservation technology adoption is certainly warranted. The goal of spreading conservation agriculture globally is not only laudable, but perhaps still reasonable" (Knowler and Bradshaw, 2007, p. 45). While some studies have found that social capital has a negative relationship or insignificant relationship, more studies find that social capital has a positive influence on the adoption of SWC practices among different communities in Africa. Additionally, memberships to groups such as farmer organizations or other groups in African communities, which can be seen as a dimension of social capital, also have a mostly positive influence on the adoption of SWC practices (see the "Social Capital" column in Table 2.1).

Table 2.1 Selected variables from adoption studies.
(+) - Positively significant/positive relationship; (-) - Negatively significant/positive relationship; (NS) - Not significant

				Variables											
Country	Study	SWC Practice(s)	Methods	Age	Gender	Education	Family/Household Size	Extension/ Training	Secure Tenure	Slope	Farm Size	Labor	Off-Farm Income/Non Farm activities	Memberships to farmer organizations/other	Social Capital (SC)
Burkina Faso	Sidibe (2005)	Zai	Probit model	NS		+	+								
Ethiopia	Amsalu & de Graaff (2007)	Stone Terraces	Bivariate Probit model	+	NS		NS	NS	NS	+	+		NS		
	Anley et al (2007)	Soil bund, improved cut-off drain, fanya juu terraces, traditional ditches, trash lines	Tobit model	-		+		+		+			NS		
	Gebremedhin & Swinton (2003)	Soil bunds & stone terraces	Probit model & truncated regression						+	+					NS
	Shiferaw & Holden (1998)	Bunds and Fanya Juu Terraces	Ordinal logit Model	-		NS	-			+	+				
	Teklewold, & Koehlin (2011)	Stone Terraces and Soil bunds	Multinomial logit model	-	+			+		+		+	+		
	Teshome et al (2016a) (Final adoption phase)	Soil bunds, fanya juu terraces, stone bunds	Probit model	NS			NS	+	+	- (On gentle slopes)	-	+	NS		+

Table 2.1 ***Selected variables from adoption studies. (continued)***
(+) - Positively significant/positive relationship; (-) - Negatively significant/positive relationship; (NS) - Not significant

				Variables											
Country	Study	SWC Practice(s)	Methods	Age	Gender	Education	Family/Household Size	Extension/ Training	Secure Tenure	Slope	Farm Size	Labor	Off-Farm Income/Non Farm activities	Memberships to farmer organizations /other	Social Capital (SC)
Ethiopia (continued)	Teshome et al (2016b)	Bunds, fertilizer and compost	Factor Analysis & Ordinary Least Squares												+ (different forms of SC had positive influences on different practices)
	Wossen et al (2015)	Stone & soil bunds, fanya juu terraces, contour ploughing, alley cropping, water harvesting	Random effect probit model & fixed effect logit model												+ & - (Different forms of SC had both positive & negative on adoption)
Ethiopia, Kenya, Malawi, Tanzania	Kassie et al (2015)	Terraces, grass strips, ridges,soil and stone bunds	Multivariate probit model	- (Ethiopia)	NS (all countries)	NS (all countries)		+ (Ethiopia, Kenya, Malawi)	+ (Malawi)	+ (Tanzania, Malawi)	NS (all countries)				+ (all countries)
Ghana	Abdulai & Huffman (2014)	Earthen Bunds, Ridges	Probit model	NS		+	+	+	+	+			-	+	
	Abdulai et al (2011)	Irrigation technology	Probit model		NS	+	+	+			+			+	

Table 2.1 *Selected variables from adoption studies. (continued)*
(+) - Positively significant/positive relationship; (-) - Negatively significant/positive relationship; (NS) - Not significant

				Variables											
Country	Study	SWC Practice(s)	Methods	Age	Gender	Education	Family/Household Size	Extension /Training	Secure Tenure	Slope	Farm Size	Labor	Off-Farm Income/Non Farm activities	Memberships to farmer organizations/other	Social Capital (SC)
Kenya	Kabubo-Mariara (2007)	Soil bunds, Terraces, Planting drought resistant, vegetation/trees, other	Random effects regressions		NS	+ (post secondary education)			+						
	Marenya & Barrett (2007)	Stover/trash lines; Agroforestry; Livestock; Manure; Inorganic chemical fertilizers	Multivariate probit model	-	+ (male)	+					+		-		
	Mwangi et al. (2014)	Tree Planting; roof catchment; water demand management	Stepwise multiple linear regression models											+	
	Nyangena (2008)	Bench terraces; Fanya juu; Infiltration ditches	Principal component analysis and Random effects probit model			-			+	+	-				+
Niger	Baidu-Forson (1999)	"tassa," & half crescent earthen mounds	Tobit model	NS				+							
Nigeria	Okoye (1998)	Zero tillage, minimum tillage, contour stripping, not burning the field, tree planting	Ordinary least squares	+		-					+		NS		

Table 2.1 ***Selected variables from adoption studies. (continued)***
(+) - Positively significant/positive relationship; (-) - Negatively significant/positive relationship; (NS) - Not significant

				Variables											
Country	Study	SWC Practice(s)	Methods	Age	Gender	Education	Family/Household Size	Extension/ Training	Secure Tenure	Slope	Farm Size	Labor	Off-Farm Income/Non Farm activities	Memberships to farmer organizations/ other	Social Capital (SC)
Tanzania	Kassie et al (2013)	Various	Multivariate probit model	NS	NS	NS	NS		+	+				+	
	Mbaga-Semgalawe, & Folmer (2000)	Fanya juu, bench terraces, infiltration ditches and macrocontour lines	Logit model		NS	NS		NS			+	NS	-		
	Tenge et. al (2005)	Vegetative strips; Bench terraces; Fanya juu terraces; Infiltration ditches; Cut off drains	Cluster and cross tabulation analysis	-		+			- (insecure tenure)	NS		NS	-		
Zambia, Malawi, Mozambique	Njuki et al. (2008)	Variouus	Factor Analysis (Diiferent types of social capital is explored) & Logit model												+ & - (Different forms of SC had both positive & negative influences on different practices)
Zimbabwe	Mazvimavi & Twomlow (2009)	Various	Tobit model	NS	+ (male)			+			+	NS			

In a broader context, Jan and Cornelia Flora discuss social capital as part of the Community Capitals Framework (CCF). The Floras created the framework as a way to understand how all the seven capitals (i.e. natural, cultural, human, social, political, financial, and built) work within a community (Flora, Flora, and Gasteyer, 2016). CCF uses a systems view and identifies "assets in each capital (stock), the types of capital invested (flow), the interaction among the capitals, and the resulting impacts across capitals" (Emery & Flora, 2006, p. 20). That is to say, the seven capitals are all interconnected. Emery & Flora (2006) discuss the role of social capital in community development in terms of "spiraling up" and "spiraling down." Spiraling down refers to a community experiencing losses (i.e. losses in population, jobs, income, etc.) resulting in a system-wide loss of assets (Emery & Flora, 2006). Regarding the capitals, losses in one type of capital can lead to the decline of other capitals (Emery & Flora, 2006). Spiraling up refers to gains in one capital leading to a higher likelihood there will be gains in others (Emery & Flora, 2006). The study concludes social capital can help communities spiral up and increase the effectiveness of the other capitals: "increases in both the stocks and flows of social capital were the initiating factors in the spiraling up process" (Emery & Flora, 2006, p. 33).

Miller and Buys (2008) state that the assumption is that social capital encourages community involvement and participation which is vital to addressing environmental challenges at the community level and thus social capital should be able to foster sustainability within a community. Dale (2005) states to achieve sustainable development collective mobilization of people in communities around the world is needed:

> The necessary will and engagement, individually and collectively, have to be mobilized, and this is why social capital is the most critical capital for the more rapid diffusion of sustainable development principles and practices (Dale, 2005, p.19).

Social capital clearly plays a role when it comes to facing environmental challenges and improving community development. Through this dissertation, I intend to understand how social capital can be used to improve the adoption of SWC practices. Studies about social capital and SWC adoption

have been increasing, but more work remains to be done (Knowler, 2015). Additionally, very few studies have assessed social capital and the adoption of SWC practices in Kenya. While social capital and the role it has on the adoption of SWC practices is explored in detail in this dissertation, the implications of this study's findings can be applied in other contexts where communities can use social capital to face environmental challenges.

Defining Social Capital

The idea of social capital has been in existence long before Bourdieu (1986), Coleman (1988) and Putnam (1995) brought the concept to the mainstream (Woolcock & Narayan, 2000). In 1916, Hanifan used the concept to discuss the role of community participation in improving school performance (Woolcock & Narayan, 2000). Bourdieu, Coleman and Putnam, however, are cited by a multitude of scholars as the key players who have shaped how social capital has been viewed in recent years (see- Ballet, Sirven, & Requiers-Desjardins, 2007; Bisung & Elliot 2014; Cramb, 2005; Webb & Cary, 2005; Kusakabe, 2012; Pelling & High, 2005). In particular, Putnam's work on social capital has provided the most inspiration for a variety of fields including schooling and education, economic development, and public health to name but a few (Woolcock & Narayan, 2000; Pretty & Ward, 2001; Pelling & High, 2005). Putnam (1995) defines social capital as, "features of social life—networks, norms, and trust—that enable participants to act together more effectively to pursue shared objectives" (p. 665). In terms of natural resource management and community development, social capital has been defined in several ways. Selected definitions of social capital are provided in Table 2.2.

Table 2.2 Selected definitions of social capital

Study	Definition of Social Capital
Flora & Flora (2013)	"…involves mutual trust, reciprocity, groups, collective identity, working together, and a sense of a shared future" (p. 11).
Grootaert & Bastelaer (2001)	"Social capital refers to the internal social and cultural coherence of society, the norms and values that govern interactions among people and the institutions in which they are embedded. Social capital is the glue that holds societies together and without which there can be no economic growth or human wellbeing" (p. iii).
Lin (2001)	"…the resources embedded in social networks accessed and used by actors for actions" (p.25)
Ostrom (1995)	"Social capital is the arrangement of human resources to improve flows of future income" (p. 132).
Ostrom (2000)	"Social capital is the shared knowledge, understandings, norms, rules, and expectations about patterns of interactions that groups of individuals bring to a recurrent activity" (p. 176). (Based on Coleman 1988; E. Ostrom 1990, 1992; Putnam, Leonardi, and Nanetti 1993).
Pretty and Ward (2001)	"The term captures the idea that social bonds and social norms are an important part of the basis for sustainable livelihoods" (p.210).
Selman (2001)	"Social capital may be understood as a glue which holds communities together through mutual interdependence" (p.14).

The World Bank uses six dimensions as proxies of social capital: groups and networks; trust and solidarity; collective action and cooperation; information and communication; social cohesion and inclusion; and empowerment and political action (Dudwick, Kuehnast, Jones, & Woolcock, 2006). For this dissertation, social capital was defined using the sources above and is also presented in terms of dimensions. The study defines social capital as the groups and networks, trust and reciprocity, formal and informal rules, and information that informs the interactions among persons that lead to collective action. These dimensions will be defined further in Chapter 3.

Connecting Social Capital with SWC Practice Adoption

Leahy & Anderson (2010) state that there are three key aspects of social capital: “social organization and networks, community resources available for individual use, and positive or negative group externalities” (p. 226-227). Each of these aspects will be defined below followed by a description of how each aspect has been explored in previous SWC adoption studies. Social capital has also been discussed in the forms of structural and cognitive social capital (Webb & Cary, 2005; Uphoff & Wijayaratna, 2000). Cognitive and structural social capital will be defined, and previous SWC adoption studies that have explored these two forms of social capital will also be discussed.

Social organization and networks

Social organizations and networks refer to the social networks that exist within communities and the connections between individuals (Leahy & Anderson, 2010). There are three types of connections among individuals or three forms of social capital: bonding, bridging and linking capital (Leahy and Anderson, 2010; Plummer & FitzGibbon 2006; Pretty 2003; Pretty & Smith, 2004). Bonding capital refers to ties that are among similar types of people (i.e. people who share the same class, ethnicity, and backgrounds) (Putnam, 2001; Flora and Flora, 2013). Bridging capital applies to ties among persons who are unlike each other (Putnam, 2001). Flora and Flora (2013) add that bridging ties are "single-purpose or instrumental, whereas bonding ties are affective or emotionally charged” (p. 127). Lastly, linking capital refers to the connection between a community (or groups within a community) and external entities. This type of social capital can be described as “the ability of groups to engage vertically with external agencies, either to influence their policies or to draw on useful resources” (Pretty & Smith, 2004, p. 633). Using bridging and bonding capital, Flora et al., (2016) provide their own social capital typology. Communities with low bonding and bridging capital show a lack of or absence of social capital (Flora et al., 2016). On the other hand, communities with high bridging and bonding capital

develop Entrepreneurial Social Infrastructure (ESI). ESI is a form of community action where community members make decisions based on the good of the community. ESI is a consequence or outcome of communities exhibiting high bridging and bonding capital (Flora et al., 2016).

In terms of SWC adoption, Njuki et al., (2008) found that the three types of social capital (bonding, bridging, linking) can affect the adoption of SWC practices in different ways in Southern Africa. For example, farmers with more linking and bridging capital were found to utilize more knowledge intensive SWC practices (such as crop residue incorporation) (Njuki et al., 2008). The knowledge of how to use more complex SWC practices is developed through bridging capital by building connections at on-farm demonstrations or visiting other farmers who are already incorporating practices (Njuki et al., 2008). Bonding capital was found to significantly and positively influence the adoption of only one SWC practice: the use of cover crops (Njuki et al., 2008). Njuki et al. (2008) draw from Winters, Cavatassi, and Lipper (2006) stating that farmers with strong bonding capital are less likely to use a variety of SWC practices. Referring to Flora et.al's (2016) social capital typology, this instance of strong internal ties among farmers can be termed 'Strong Boundaries.' Strong boundaries describes a community where bonding capital is high and bridging capital is low (Flora et al., 2016). In this situation, there is no external influence imparted on the group (Flora et al., 2016). Among groups with low bridging capital and high bonding capital, there is a reluctance to embrace change (Flora et al., 2016).

Community resources available for individual use

The second key aspect of social capital, after social organizations and networks, is the availability of community resources to an individual. According to Leahy & Anderson (2000), the availability of community resources to an individual refers to the fact that social capital does not exist within a person but can be accessed for use by an individual for personal improvement or that of the community (Leahy & Anderson, 2010). Onyx and Bullen (2000) put it a little differently stating that social

capital is a form of “people power” that can be harnessed by anyone regardless of their position in society (p. 39). In an agricultural context, Njuki et al. (2008) state individuals in farmer groups can do things they were unable to do on their own such as benefit from one another by sharing transportation.

Positive or negative group externalities

Finally, negative or positive group externalities address the idea that social capital can have both positive and negative effects. From my understanding of the literature, social capital can manifest both negatively or positively but is not inherently “bad” or “good.” Adler and Kwon (2000) explain social capital can have both benefits and risks. Some of the benefits they discuss include improved access to information and information diffusion or community solidarity (Adler and Kwon, 2000). Risks of social capital can include decreased innovation or restricted freedom. Other authors have also discussed the negative manifestations of social capital. Leahy and Anderson (2010) discuss the negative effects of social capital in terms of exclusivity: social capital "can be used to benefit members of formal and informal organizations at the expense of nonmembers" (p. 227). Ostrom (2000) discusses that social capital can be used as the basis of formation by gangs and cartels. In another example, an authoritarian government can use force to destroy other forms of social capital while building its own (Ostrom, 2000).

In terms of SWC practice adoption, Njuki et al. (2008) found that strong bonding capital was a hindrance in terms of diversifying to more than one SWC practice. In another study, Wossen et al., (2015) found that strong connections among kin members (a large group of relatives where sharing and loyalty is a vital component of being part of the group) in Ethiopia had a negative influence on the adoption of SWC practices. This negative influence is due to the free-riding behavior of individuals within a kinship as adopters are forced to share the benefits with relatives (Wossen et al., 2015). Adler and Kwon (2000) state that the beliefs and norms of a group, which are described as the “source” of a group’s social capital, can affect a group’s externalities (p. 108). As an example, Adler and Kwon (2000)

explain the beliefs that govern a gang determine whether the gang has a negative or positive effect on a community: “Depending on the norms and beliefs that guide its action, the street gang can wreak havoc on a neighborhood or serve as a powerful force assisting its social integration” (p. 108).

Structural and cognitive social capital

Social capital can be referred to as structural or cognitive. Structural social capital relates to objective and observable features including networks, associations, institutions and the rules and procedures they embody (Uphoff & Wijayaratna, 2000). Cognitive social capital refers to intangible characteristics including attitudes, behaviors, shared values, reciprocity and trust (Uphoff & Wijayaratna, 2000).

Nyanga, Kessler and Tenge’s (2016) study of SWC adoption in Tanzania provides an example of structural social capital and its influence on SWC practices. Their study found that farmers derived benefits from labor sharing groups: "Farm household's knowledge sharing is stimulated by associations and group dynamics" (Nyanga et al., 2016, p. 264). Additionally, farmers are able to learn from each other and implement and adapt SWC practices (Nyanga et al., 2016). The study concludes that social capital (in the form of structural social capital) may have an influence on the use of SWC practices in their study area (Nyanga et al., 2016). Similarly, Teshome, de Graaff, and Kassie (2015) found that farmers participating in labor sharing groups during times of labor shortage were more likely to replicate and continue using SWC practices. Social capital, in the form of cooperation among farmers on adjacent lands, was seen to be an important influence for expanding the use of SWC practices and their continued use (Teshome et al., 2015). Kassie et al., (2015) focused their adoption study in Kenya, Malawi, Ethiopia, and Tanzania. The study recommended that policymakers should find ways to strengthen "local collective institutions" to encourage the adoption of SWC practices (Kassie et al., 2015,

p. 410). Kassie et al.'s (2015) recommendation relates to the need to strengthen structural social capital to improve SWC adoption.

Nyangena's (2008) Kenyan study implies that understanding cognitive social capital is an important aspect of encouraging the adoption of SWC practices. It is important to understand both the underlying social structure and economics of a community to understand the best way to invest in soil and water conservation (Nyangena, 2008). Nyangena (2008) concludes by stating: "The role of social capital is to create avenues to finding solutions to collective dilemmas, improve access to technology and increase the benefits of investment" (p. 726).

While structural and cognitive social capital have been presented separately, Uphoff & Wijayaratna (2000), state that when exploring social capital within in a community it may be hard to distinguish between or separate the two. They go on to say structural and cognitive social capital: "are commonly connected and mutually reinforcing" (Uphoff & Wijayaratna, 2000, p. 1877).

Addressing the forms of social capital in this dissertation

Thus far, I have discussed social capital in terms of social organization and networks (bonding, linking, bridging capital), community resources available for individual use, positive or negative group externalities, structural social capital and cognitive social capital. Nyangena's (2008) study exploring SWC adoption in Kenya developed four social capital indices (Association, Trust, Community, and Information) to evaluate the level of social capital in three towns. In my opinion, these four indices are able to capture the various aspects and forms of social capital that have been discussed above. For example, Nyangena (2008) defines "Association" as memberships to community groups. "Association" thus relates to structural social capital and community resources available for individual use. "Community" refers to volunteerism and community involvement, which relate to aspects of bonding capital and cognitive social capital. Studying social capital in terms of dimensions rather than in its forms

(bonding, bridging, linking, structural and cognitive) could provide a more detailed look at how social capital operates within a community and how these dimensions relate to one another and inform adoption. To my knowledge, few studies have assessed the level of social capital in terms of indices or dimensions.

Using the four dimensions defined for this study, the forms of social capital discussed above will be explored in the context of understanding how they affect the adoption of SWC practices. Listed below are the four dimensions used to define social capital and the forms of social capital to be explored under each dimension:

- Dimension 1: Groups and Networks
    - Social organization and networks
        - Bonding Capital
        - Bridging Capital
        - Linking Capital
    - Community resources available for individual use
    - Structural social capital
- Dimension 2: Trust and Reciprocity
    - Social organization and networks
        - Bonding Capital
    - Cognitive social capital
- Dimension 3: Information
    - Social organization and networks
        - Bonding Capital
        - Bridging Capital
        - Linking Capital
- Dimension 4: Formal and Informal Rules
    - Cognitive social capital
    - Structural social capital

In addition to the dimensions and different forms of social capital, the presence of a shared vision for sustainable agricultural practices among farmers in Merigi Ward will be investigated. Under the Community Capitals Framework, Flora et al. (2016) discuss that a shared vision can help enhance community initiative, responsibility, and adaptability which are needed to build social capital in a community. Selman (2001) states that one of the ways social capital can be destroyed is when a community lacks shared memories or future hope. Webb & Cary (2005, p. 127) suggest that a

"commitment to a shared vision" is a possible measure of social capital. Thus, the study incorporates an assessment to understand the extent to which the farmers share a common vision in terms of future agricultural practices in the basin. Few studies have assessed this aspect in terms of SWC practice adoption.

The need for partnerships and state-society-synergy

In addition to social capital, the literature has pointed to the need for partnerships between communities, government and other organizations and entities for effective natural resource management. Dale and Newman's (2010) study concludes that "no one community can respond on their own initiative; it requires unprecedented levels of cooperation and partnership, it means working both locally and globally simultaneously through networks of collaboration" (p. 18). Dale and Newman (2010) go on to say that partnerships should be between local organizations, leaders, various levels of government, the private sector and other pertinent organizations. Evans (1997) discusses "state-society synergy" where governments and mobilized communities enhance each other's development activities (p.178). Essentially, Evans (1997) concludes synergy between governments and communities is beneficial. Governments help create social capital and connecting communities to public agencies helps the effectiveness of government (Evans, 1997). Communities need access to inputs that only the government can provide while the government needs to form allies within a community to get access to local knowledge and experience (Evans, 1997). This relationship leads to enhanced development.

Woolcock and Narayan (2000) provide four perspectives or views on social capital in development: (1) the communitarian view (2) the network view (3) the institutional view and (4) the synergy view. The synergy view integrates the network view (vertical and horizontal associations between people and relations among organizations like community groups) and the institutional view (which argues community networks and civil society are the results of the political, legal, and

institutional environment) (Woolcock & Narayan, 2000). Under the synergy view, Woolcock and Narayan (2000) discuss "States, firms, and communities alone do not possess the resources needed to promote broad-based sustainable development; complementarities and partnerships forged both within and across these different sectors are required," (p.236). Both strengthened social capital within a community and partnerships between governments, communities and other relevant organizations are needed to create more sustainable communities.

Professionals working in fields related to the built and natural environments are faced with challenges such as climate change, population growth, urbanization, water quality, to name but a few, that cannot be easily resolved (Brooks, 2002). The challenges that have no easy answers are known as "wicked" problems. Brooks (2002) states that Horst Rittel and Melvin Webber introduced the term to describe problems that are "ill-and variously defined; often feature a lack of consensus regarding their causes; lack obvious solutions or even agreement on criteria for determining when a solution has been achieved; and have numerous and often unfathomable links to other problems" (p. 12). Erosion can be seen as a "wicked" problem that requires multiple partners to create solutions. To address wicked problems, Innes and Booher (2010) propose the concept of collaborative rationality. The concept focuses on a process of deliberation where all affected parties and individuals are brought together to interact face to face and work together to seek consensus through authentic dialogue (Innes & Booher, 2010).

To face a challenge such as soil erosion, all affected parties need to come together and work in tandem towards solutions. The SWC practice adoption literature supports this supposition. Scholars are calling for increased partnerships to deal with erosion and the use of soil and water conservation techniques. Kassie et al., (2015) call for the establishment and strengthening of local institutions but also state that it is important to provide local institutions with connections to other organizations so that they can get access to information, credit and other beneficial services. Similarly, Nyanga et al. (2016)

advise that partnerships among private and public sectors at every level (community, regional and national) are paramount. These partnerships enable greater access to resources that will enable communities to scale up sustainable land management practices (Nyanga et al., 2016). Abdulai & Huffman (2014) state that an environment favorable to the private sector should be created to enhance the work of government and extension agents working in soil conservation. In Kenya, Recha, Mukopi, and Otieno (2015) call for more collaborative efforts among government extension agents, non-governmental organizations and religious institutions. Collaborative processes can lead to more than just beneficial decisions; they can lead to improved capacities within communities (Innes and Booher, 2010).

The Mara River Basin presented a unique opportunity with the formation the Mau Mara Serengeti Sustainable Water Initiative (MaMaSe). MaMaSe is a public-private partnership (P3) within the basin. MaMaSe partners include international and national governments, local community organizations, universities (including Wageningen University) and other knowledge institutions, private sector companies, civil society and non-governmental organizations (MaMaSe, 2016b). The goal of the MaMaSe initiative is to support the people and institutions of the MRB "in a process of structural change, promoting water-wise economic development that lifts people out of poverty and sets them on a sustainable path to improved wellbeing and self-reliance," (MaMaSe, 2016a, para 1). The MaMaSe initiative provides an opportunity to understand how a public-private partnership can affect the level of social capital within a community. Understanding how social capital affects the adoption of SWC practices and understanding how partnerships affect the level of social capital allows policymakers to use these two assets to improve natural resource management.

The next section discusses the use of quantitative and qualitative approaches in understanding SWC practice adoption. The need for more qualitative methods and the advantages of using a

qualitative approach to gain further insight into adoption processes of these sustainable practices are presented.

Qualitative vs. Quantitative Approaches to understanding SWC adoption

Research is based on assumptions about how we see the world and how we can come to understand it (Trochim, 2006). Corbetta (2003) presents three basic paradigms of social research: positivism, post-positivism, and interpretivism. Under the positivist paradigm social reality is 'real' and understandable or knowable (Corbetta, 2003). The positivist approach is based on empiricism where measurement and observation through experiments are key components (Trochim, 2006). Post-positivism rejects the positivist paradigm contending that we can only know social reality in a probabilistic way (Corbetta, 2003). In other words, one cannot be completely certain that we truly understand social reality (Creswell, 2003). This perspective is known as critical realism (Corbetta, 2003). Post-positivism still uses empiricism but relies on multiple measurements and observations to get a better picture of what is going on in reality and reduce error (Trochim, 2006).

Interpretivism can be broken down into constructivism and relativism (Corbetta, 2003). Constructivism refers to individuals giving subjective meaning to their experiences (Creswell, 2003). Relativism refers to how these meanings or "constructed realities" can vary from person to person and even between groups and cultures (Corbetta, 2003, p. 15). Creswell (2009) introduces two more paradigms: the advocacy or participatory paradigm and the pragmatism paradigm. The participatory paradigm grew during the 1980s and 1990s when researchers felt that the post-positivist view did not satisfy the needs of marginalized communities (Creswell, 2009). Thus, the paradigm focuses on the need to integrate research inquiry with politics and political agendas (Creswell, 2009). Participatory research includes an agenda for reform and works collaboratively with its participants (Creswell, 2009). In terms of the pragmatism paradigm, there are various approaches but the central idea is that the focus of

research is the problem and researchers use the necessary methods to understand the issues at hand (Creswell, 2009).

Three approaches to research emerged from these paradigms: quantitative methods, qualitative methods, and mixed methods. The positivist and post-positivist paradigms are both associated with quantitative techniques, though post-positivism can sometimes use qualitative approaches (Corbetta, 2003). The interpretivism and participatory paradigms are generally associated with qualitative methods (Creswell, 2009). Creswell (2009) states that pragmatism applies to mixed method research as it allows for multiple methods and forms of data collection and analysis. It also accommodates different worldviews and assumptions (Creswell, 2009).

Table 2.1 above (see pages 31 – 34) demonstrates that most SWC practice adoption studies tend to employ quantitative methods to examine social capital. Furthermore, the studies that assess social capital and adoption (see in Table 1: Kassie et al., 2015; Njuki et al., 2008; Nyangena, 2008; Teshome et al., 2016a; Teshome et al., 2016b; Wossen et al., 2015) tend to also use quantitative methods. While the findings from these quantitative studies measure the likelihood of whether social capital influences adoption, they do not explore the processes or how social capital operates.

Kassie et al.'s (2015) quantitative study states farmers who are a part of organized groups are "more likely" to adopt various soil and water conservation practices (p. 407). The study, however, does not describe how being a member of a group improves the adoption of SWC practices or how groups improve information flow or how information is acquired. Nyangena's (2008) study of adoption in Kenya uses principal component analysis and regression to understand what factors influence the adoption of SWC practices. The study found that trust among members in the community, the level of participation in community projects and volunteerism in the community had a significant influence on the adoption of SWC practices. The study, however, only offers possible interpretations of why and how these particular variables have an impact. Similarly, Wossen et al.'s (2015) study discusses the significance of variables

without delving into context specific detail of how those variables work within the community. Knowler and Bradshaw's (2007) endeavor to find universal variables that predict adoption state that the need for context-specific policies and strategies is necessary for the adoption of conservation agriculture. Njuki et al. (2008) calls for the need to develop multiple indicators for the different forms of social capital. More recently, Teshome et al. (2016b) recommend that more attention should be given to how social capital operates within communities as SWC practice adoption strategies are developed and implemented. A qualitative approach can contribute to these research needs.

According to the World Bank, qualitative studies are more readily able to explore context and process (Dudwick et al., 2006). It is my opinion, that what is lacking from quantitative studies is a better understanding how social capital operates; its processes that influence SWC practice adoption. Thus, a qualitative approach is used to understand how social capital operates and is used within the context of Merigi Ward, Kenya. To this author's knowledge, there have been very few qualitative studies that assess the adoption of SWC practices and furthermore even fewer explore social capital and adoption. Miheretu (2014) integrates qualitative techniques (focus group discussions and key informant interviews) to understand farmer perception and adoption of SWC practices in Ethiopia, but social capital was not examined within the study.

Research in fields such as management, agricultural economics, and agribusiness are beginning to investigate "organizational resources" (i.e. social capital, knowledge networks) as potential influencers of adoption of agricultural technology versus solely looking at tangible farm and economic characteristics (Micheels & Nolan, 2016, p. 127). The question now seems to be how social capital affects adoption versus whether social capital does or does not influence adoption. Social science fields can greatly contribute to this line of inquiry using qualitative research to answer some of the questions left by quantitative methods. Furthermore, research from qualitative studies can be used to inform and design mixed method approaches which the World Bank recognizes as the preferred approach to

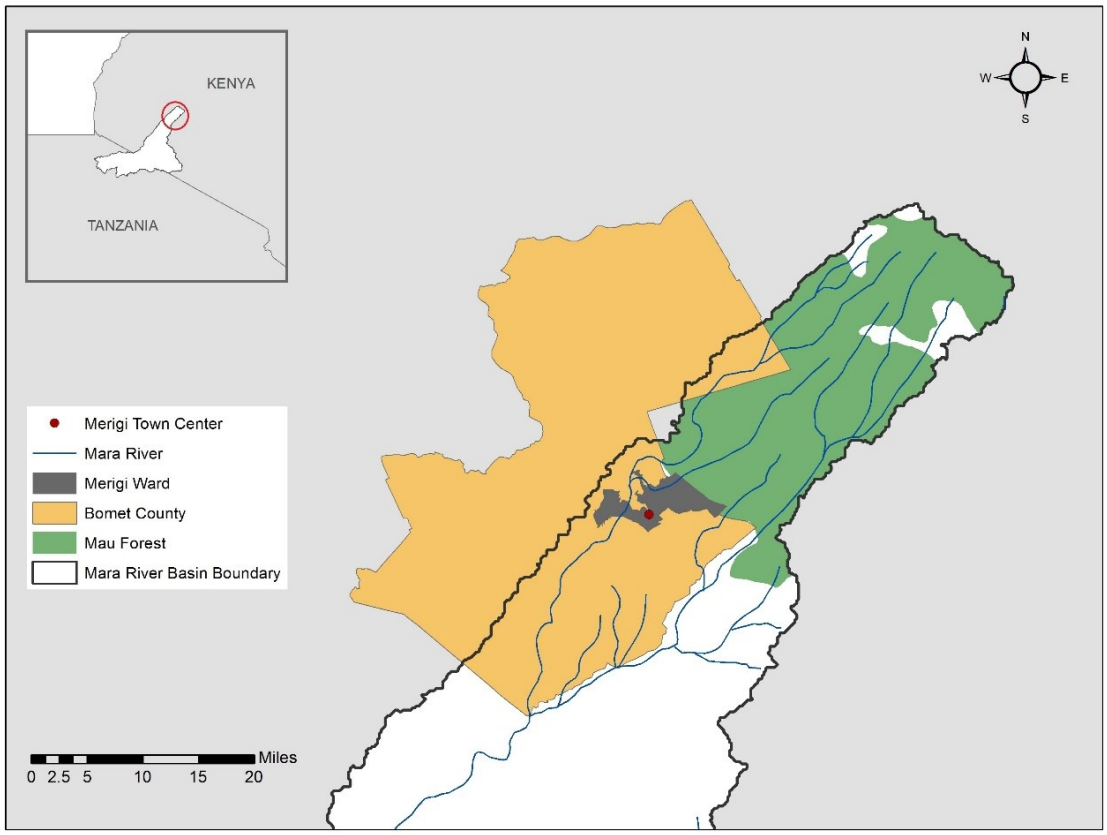
studying social capital (Dudwick et al., 2006). The qualitative research conducted in this dissertation is a starting point for future social capital studies within the Mara River Basin. It is my hope that this study is used as the basis for mixed method studies within the basin and beyond to better inform policy decisions. The next chapter describes the study area in more detail and explains the methods used to answer the two main research questions posed in this study.

Chapter 3 - Methods

Study Area

The upper MRB has undergone substantial land use and land cover changes due to population pressures (Atisa et al., 2014). The land use changes from grassland or forest to agricultural land have caused extensive erosion in the upper basin thus degrading the water quality of the Mara River and contributing to increased sedimentation downstream (Defersha et al., 2012; Mati et al., 2008). Located within this area of extensive erosion, lies Merigi, a ward in Bomet County (Figure 3.1). Kenya is divided into counties which are further divided into units called constituencies. Each constituency is divided into wards. Merigi is a ward in the Bomet East Constituency.

Figure 3.1 Merigi Ward located in east Bomet County (Data sources: Van Der Kwast, 2014; Flannery, 2014; OCHA – ROSEA, 2012; Josiah, 2015; ILRI GIS Services, 2007; Njiru, 2015)



Bomet County spans approximately 1,997.9 km² with a total population of approximately 730,129 (Bomet County Government, 2017a). According to the Bomet County Government, Merigi Ward's total land area is 58 km^2 with a total population of approximately 29, 568 (Bomet County Government, 2017b). Figure 3.2 shows Merigi Ward's main center where people come to buy goods and is also home to the Merigi Farmer's Cooperative. Bomet County has a large population of children under the age of 14 (47%) while only 3.3 percent of the population is above 65 years of age (Bomet County Government, 2017b). This large population of children under 14 years of age is due to the high fertility rates within the county (Ngugi, 2013). In Bomet County, 42% of households have a household size of 4 to 6 people (Ngugi, 2013).

While many different tribes are found throughout the MRB, the main tribe within Bomet County is the Kipsigis (Bomet County Government, 2017c). The Kipsigis people are generally known to be farmers, growing a variety crops and participating in livestock rearing (WREM, 2008). Of Bomet County's households, 86% engage in farming in some way or form (Kenya Open Data, 2005). Figure 3.3 shows a smallholder farm in Merigi Ward. The main agricultural products in the county include dairy products, maize, beans, Irish potatoes and sweet potatoes (Bomet County Government, 2017b). Regarding main employment in the county, 48.3% of individuals between the ages of 15-64 engage in an agriculturally oriented family business (Ngugi, 2013). While within Merigi Ward, 61.8% of working age individuals participate in a family agricultural business for employment (Ngugi, 2013). About 10% of individuals work for pay in some capacity, while 6.9% own a family business not related to farming or agriculture (Ngugi, 2013). Ngugi (2013) state that 12.9 percent of the population are full-time students.

Figure 3.2 Merigi Ward's main center. Shops and businesses are located in this area. (Source: Photo by Author)

Figure 3.3 A smallholder farm in Merigi Ward. The image background shows the hilliness of the area. (Source: Photo by Author)

Communities within Bomet County rely heavily on the natural systems of the Mara River Basin. Most families are directly dependent on their immediate environment for their well-being. As a whole, only 24% of Bomet County's population has access to improved water sources (e.g. protected springs, protected wells, boreholes, piped water, piped rainwater collection) while the rest depend on unimproved water sources (including rivers or streams, lakes, unprotected springs or wells) (Ngugi, 2013). Within Merigi Ward, 68.3% of residents depend on streams or rivers as their main water source, and 11.9% of households rely on unprotected springs (Ngugi, 2013). Overall, 86.7% of households in Merigi Ward rely on unimproved water sources (Ngugi, 2013). Households within the county are also highly reliant on trees to provide cooking fuel for their families. Within Bomet County, 92% of households use firewood as cooking fuel while 88.6% of households depend on firewood in Merigi Ward.

Poverty remains a major struggle for the people of Kenya. In Bomet County, 58.7% of the population live in poverty (Bomet County Government, 2017b) which is much higher than Kenya's national poverty level of 45.2% (Ngugi, 2013). Education is seen as a way to improve one's well-being and standard of living (Ngugi, 2013). Of Bomet County's population, 64.4% have received a primary school education while only 18.5% have received secondary school education or higher. About 17% of the county's population has not received any form of education. Merigi Ward education levels are similar and are within about two percent of Bomet County. In comparison, about a quarter of Kenya's population has not received any education. Both Bomet and Merigi Ward have higher percentages of individuals completing primary education and secondary education or higher compared to the country (Ngugi, 2013). Table 3.1 provides a summary of demographic characteristics of Merigi Ward, Bomet County, and Kenya.

Table 3.1 Demographic and housing characteristics for Kenya, Bomet County and Merigi Ward.(Sources: Ngugi, 2013; KNBS, 2017; Bomet County Government, 2017b; Bomet County Government, 2017a)

	Kenya	Bomet County	Merigi Ward
Total Population	38,610,097	730,129	29,568
Education (% of residents)			
Primary	52.0	64.4	66.2
Secondary	22.8	18.5	17.7
None	25.2	17.1	16.2
Employment (% of Individuals 15 -64 years old)			
Work for Pay	23.7	17.5	10.8
Family Business	13.1	11.0	6.9
Agricultural Family Business	32.0	48.0	61.2
Full-time Student	12.8	15.6	12.9
Cooking Fuel (% of Households)			
Paraffin	11.7	1.6	1
Firewood	64.4	92	88.6
Charcoal	17	5.4	2.5
Source of Water (% of residents)			
Unimproved Water Sources	47.4	76.4	85.9
Stream/River	23.2	44.0	66.8
Pond	2.7	15.9	1.9
Unprotected Springs	5.0	9.1	12.6
Unprotected Wells	6.9	3.0	3.5

Research Questions

The research questions in this dissertation reflect the interpretivism paradigm. The different paradigms are reviewed in Chapter 2. The main goal of the interpretivism paradigm is comprehension (Corbetta, 2013). I seek to understand in what ways social capital, a complex and abstract concept, can affect the adoption of SWC practices and understand the effect of a private-public partnership on the level of social capital. Specifically, the first research question delves into the need to understand how social capital operates and influences adoption within the context of Merigi Ward:

1. How does social capital influence the adoption of soil and water conservation practices among smallholder farmers within Merigi Ward, Kenya?

The second research question lends back to the discussion regarding the importance of state-society synergy and partnerships. The MaMaSe initiative's effect on the level of social capital within the community is investigated:

2. How does the MaMaSe initiative influence the level of social capital among smallholder farmers within Merigi Ward, Kenya?

Qualitative methods will be used to answer these two research questions. An advantage of qualitative methods is its ability to collect data on complex issues (Johnson & Onwuegbuzie, 2004). Qualitative data capture rich details of the phenomena being studied and allows the researcher to explore how and why the phenomena occur (Johnson & Onwuegbuzie, 2004). Additionally, qualitative methods enable the researcher to explore a dynamic and changing process as patterns can be gleaned from the data (Johnson & Onwuegbuzie, 2004). Another advantage of qualitative research is the fact that the study participants' own constructs are the basis for data analysis (Johnson & Onwuegbuzie, 2004). In quantitative methods, the researcher creates his or her own constructs which may be misrepresentative (Johnson & Onwuegbuzie, 2004). Qualitative approaches are also responsive to changes that occur during the study, particularly in terms of fieldwork, researchers are able to adapt their research and change as needed (Johnson & Onwuegbuzie, 2004). Using a qualitative approach allowed me to adapt to the unexpected changes I faced in Merigi Ward. Lastly, qualitative data is generally collected in naturalistic settings (Johnson & Onwuegbuzie, 2004). Thus, the phenomenon is studied as it is, with no need to manipulate the environment as is done in an experimental setting (Norum, 2017).

Data Collection

Semi-structured interviews

Interviews were chosen as the main technique to gather data for this study. Dunn (2010) outlines four main strengths of using interviews in research. Interviews can be used to: (1) provide additional knowledge that other methods such as observations or written surveys cannot produce; (2) understand behaviors and motivations; and (3) understand different opinions and experiences. Lastly, interviews help empower the study participants and show respect. When entering Merigi Ward, a community that I was unfamiliar with, I needed to build trust and rapport and shift the power to the participant. Ultimately, one on one interviews were chosen to accomplish this goal as well as understand the experiences and motivations of smallholder farmers.

Interviews fall into three categories: structured, unstructured and semi-structured (Dunn, 2010). In structured interviews, interviewees are asked a series of carefully constructed questions (Dunn, 2010). The interviewer does not deviate from the interview schedule and asks the questions in exactly the same order with every interview (Dunn, 2010). Dunn (2010) states that structured interviews are "question focused" (p. 109) On the other hand, unstructured interviews do not use pre-constructed questions. Rather unstructured interviews are "informant-focused" (Dunn, 2010, p. 111). The questions in an unstructured interview are based on the interviewee's responses (Dunn, 2010). Semi-structured interviews utilize prepared questions, but the interviewer can deviate and pursue additional lines of inquiry (Dunn, 2010). Questions in semi-structured interviews are focused on content and are directed to understanding the issues relevant to the research (Dunn, 2010). Semi-structured interviews were chosen for this study to allow for a guided discussion around soil and water conservation practices and social capital but also allow for a flexible environment to explore responses that were of interest and relevant to the study.

Study participants & Sampling

Smallholder Farmers

Identifying farmers for the study would have been impossible without the help of my key informant and guide. I was an outsider with no previous connections in Merigi Ward. Through WWF Kenya, I was introduced to my key informant. Key informants are generally the first contact on a project and provide a connection between the community and researcher acting as a liaison (Dunn, 2010). My key informant was a smallholder farmer in Merigi Ward, held in high regard in the community. This farmer had just retired from local political activity and had focused part of his energy as one of the leaders of the Merigi Farmer's Cooperative, the main farmers' cooperative in Merigi Ward.

Merigi Ward presented challenges when it came to creating a sampling plan. Sampling can be divided into two approaches: probability sampling and non-probability sampling (Berg & Lune, 2012). Probability sampling refers to the selection of a sample based on probability theory (Berg & Lune, 2012). Using probability sampling allows researchers to use hypothesis testing to make inferences about the larger population (Berg & Lune, 2012). Maxwell (2013) finds that the term sampling isn't truly applicable in a qualitative sense and refers to the creation of a representative sample from a target population which is the goal of quantitative studies. In a qualitative setting, non-probability sampling is more appropriate where "generalization to a broader population is neither possible nor desirable and sampling frames may not, in any case, be available" (McGurik and O'Neill, 2010, p. 205). Berg and Lune (2012) agree stating social science researchers use non-probability sampling techniques when study participants cannot be easily listed and thus using a probability sampling technique is not possible (Berg & Lune, 2012). For this dissertation, it was not feasible to compile a list of smallholder farmers within Merigi Ward due to the lack of access to addresses and plot level data. Thus, a nonprobability sampling technique was the most pragmatic choice.

There are four types of non-probability sampling methods that are commonly used: convenience sampling, snowball sampling, quota sampling and purposive sampling (Berg & Lune, 2012). Convenience sampling refers to identifying study participants that are easy to access (Berg & Lune, 2012). In snowball sampling, subjects with the necessary characteristics needed for the study are identified and recruited (Berg & Lune, 2012). The researchers then ask these study participants to refer them to other people who possess similar qualities and they are then recruited to the study (Berg & Lune, 2012). Quota sampling selects study participants according to a fixed quota (Trochim, 2006). The selection process in quota sampling is non-random (Trochim, 2006).

When using purposive sampling, participants are selected based on a "common characteristic" (McGuirK & O'Neill, 2010, p. 205). McGurik & O'Neill (2010) go on to say: "the determinants of the appropriate sample and sample size are related to the scope, nature and intent of the research and to the expectations of your research communities" (p. 205). Interestingly, some authors have used purposive sampling as an encompassing term for other non-probability sampling methods. For example, Bradshaw and Stratford (2010) include snowball and convenience sampling under purposive sampling. Trochim (2006) includes quota and snowball sampling techniques as sub-categories of purposive sampling. All in all, when purposive sampling is employed, the researchers have a particular purpose and are looking for a specific subset of people to participate in their study (Trochim, 2006).

The goal of this research was to understand how social capital influences adoption and thus only adopters of SWC practices were included in the study to observe the phenomenon. Other criteria for inclusion in the study, was the farmer had to be the head of the household or a member of the family in charge of taking care of the farm. Working with my key informant, we decided purposive sampling was the best approach to selecting farmers for the study. Through purposive sampling, we were able to make sure the farmers fit the chosen criteria and the time constraints of my site visit. Maxwell (2013) states that when it comes to qualitative research, choosing the "times, settings and

individuals" that help a researcher answer the study questions are the most important aspects to consider (p. 97). Bradshaw & Stratford (2007) state that when utilizing in-depth interviews, choosing the "right" people to participate in a study can elicit the needed findings (p. 75). With my key informant's intimate knowledge of Merigi Ward as a former community leader and now as an important member of the Merigi Farmer's Cooperative, he helped me identify suitable farmers that fit the described criteria. To make sure our study participants varied we traveled to different villages within Merigi and talked to three to four farmers in each village. Due to the rainy season at the time of my site visit, some parts of Merigi were impassable by vehicle. The rains turn the dirt roads to mud and vehicles could end up getting stuck. We decided it was safer to avoid these areas. In total, twenty-five farmers were interviewed in Merigi Ward including my key informant. The interview schedules are described below.

MaMaSe Partner Interviews

In addition to interviewing smallholder farmers, World Wildlife Fund (WWF) Kenya and SNV Netherlands Development Organization (SNV) staff were interviewed via Skype. WWF Kenya and SNV are two of the partners in the Mau-Mara-Serengeti Sustainable Water Initiative (MaMaSe) and have had a substantial presence in Merigi Ward. SNV, however, was the main partner that interacted with the farmers on soil and water conservation projects under the MaMaSe initiative. WWF Kenya provided guidance for these projects and also worked on related programs in other parts of the Mara River Basin. It is important to note that WWF Kenya, as a stand-alone organization, has been working in the basin for several years and has its own initiatives. Thus, while I was in Merigi Ward both the MaMaSe initiative and WWF Kenya projects were being conducted concurrently. Farmers discussed both MaMaSe initiative and WWF Kenya projects. A purposive sampling approach was also used to choose staff members for the interviews. The criterion for inclusion of WWF and SNV staff members in the interviews was experience working in Merigi Ward and knowledge of the MaMaSe initiative. One full-time WWF Kenya staff member who has been working with farmers on soil and water conservation programs in

Merigi Ward was interviewed. The WWF Kenya staff member was interviewed to get background information about the area, their role in soil and water conservation in Merigi Ward and the basin at large, and their role as a partner in the MaMaSe initiative. WWF staff were also asked about the challenges facing farmers implementing soil and water conservation. One SNV staff member was asked similar questions but from the perspective of specific MaMaSe activities, since SNV had conducted several soil conservation training events in the basin. Both staff members were asked to discuss the successes and challenges of the MaMaSe initiative. These interviews were used to collect supplementary information and were not included in the primary data analysis. See below for a description of the interview schedules.

Data Collection Timeframe & Saturation

I was in Kenya for approximately three weeks, however, much of the time was dedicated to securing research permits and meeting with the relevant government entities to attain permission to conduct my research in Bomet County. Once I arrived in Bomet County, I had a limited time to collect data due to my key informant's schedule and thus I ended up conducting my interviews with the smallholder farmers over a period of seven days.

Throughout the data collection period, I reviewed the interview transcripts to observe data saturation. The concept of saturation refers to collecting data until there is no "new information or insights" (Cameron, 2010, p. 159). By the end of the fifth day of data collection, I had interviewed 17 smallholder farmers. The subsequent interviews after this period did not reveal new findings that impacted the emerging themes.

Data Instruments

Measuring Social Capital

Social capital is arguably one of the hardest concepts to observe and measure (Ostrom, 2000). Many scholars and organizations have formulated strategies to measure social capital (Flora & Flora, 2013; Miller & Buys, 2008; Onyx and Bullen 2000; Siegler, 2014; Webb & Cary, 2005). The World Bank, however, has developed a vast collection of studies about social capital, including how to measure this abstract concept (Dudwick, et al., 2006; Grootaert, 2004; Grootaert & Van Bastelaer, 2001; Grootaert & van Bastelaer, 2002;). The World Bank (see Dudwick et al., 2006) uses six dimensions as proxies of social capital:

1. **Groups and networks**: "Understanding the groups and networks that enable people to access resources and collaborate to achieve shared goals is an important part of the concept of social capital" (p. 12)
2. **Trust and solidarity:** "the extent to which people feel they can rely on relatives, neighbors, colleagues, acquaintances, key service providers, and even strangers, either to assist them or (at least) do them no harm." (p.16)
3. **Collective action and cooperation:** "Collective action and cooperation are closely related to the dimension of trust and solidarity, however, the former dimension explores in greater depth whether and how people work with others in their community on joint projects and/or in response to a problem or crisis." (p. 19)
4. **Information and communication:** "Increasing access to information is increasingly recognized as a central mechanism for helping poor communities strengthen their voice in matters that affect their well-being" (p. 21)
5. **Social cohesion and inclusion:** "the tenacity of social bonds and their dual potential to include or exclude members of [a] community." (p. 22)

6. **Empowerment and political action:** "The social capital dimension of empowerment and political action explores the sense of satisfaction, personal efficacy, and capacity of network and group members to influence both local events and broader political outcomes." (p. 25)

Flora et al. (2016) state that the above World Bank measures provide a qualitative view to measuring social capital.

Nyangena (2008), who quantitatively studied social capital and the adoption of SWC practices in rural Kenya, based his survey questions on studies conducted by the World Bank's Social Capital Initiative. Like the World Bank, the study utilizes dimensions or indices to measure social capital. The four main indices in Nyangena's study include: association (degree of memberships and participation in community projects); community (volunteerism and presence in the community); trust (lending of money or food; camaraderie in reducing adverse shocks; and reciprocity) and information (sources of information) (Nyangena, 2008). The study's indicators were chosen so that they could measure: "(1) interactions with one another by borrowing small farm implements, risk coping strategies, discussing various local issues and learning about SWC techniques from each other; (2) working with neighbors and local participation in collective action activities; and (3) sources of agricultural market and public information" (p. 754). Webb & Cary (2005) also draw on the World Bank (and other entities) to formulate possible measures of social capital in the context of Landcare (an Australian program bringing community members together to manage natural resources). Webb & Cary's (2005) possible measures present an interesting perspective as they not only collect data to measure bonding and bridging capital at the community level but also draw on the ideas of synergy and the efficacy of organizations involved in the program as additional measures. Possible measures based on synergy and organizational efficacy include: number of times an organization interacts with community groups; community or group trust in

an institution(s); assistance and services given by institutions to community groups (Webb & Cary, 2005).

I drew on the World Bank (see Dudwick et al., 2006); Nyangena (2008) and Webb & Cary (2005) to develop my data instruments based on the dimensions I used to formulate my definition of social capital. The study defines social capital in four dimensions: as the groups and networks, trust and reciprocity, formal and informal rules, and information that informs the interactions among persons that lead to collective action. Other works that substantially contributed to this definition include Flora et al. (2016); Ostrom & Ahn (2003); Pretty (2003). These four dimensions of social capital are further defined as follows:

- Groups and networks refer to farmers' social networks in the form of personal relationships and/or memberships to community organizations. It also relates to the resources farmers draw from their networks and the resources farmers provide their network.
- Reciprocity refers to the exchange of goods & knowledge between people or groups as well as the relations between people or groups over time. Reciprocity is said to increase trust as it refers to the development of a relationship (Pretty, 2003).
- Formalized rules that govern conservation practices in the basin refer to laws implemented by regional or local governments that influence soil conservation practices. Informal rules are defined as local or cultural rules (can be unspoken or assumed) that influence the use of conservation practices in the basin. These local or cultural rules are not written into formal government law. For example, in a prior study in the Mara River Basin, culturally land belongs to men and thus women refused to be interviewed about soil conservation practices (Atisa et al., 2014). This refusal from female participants implied that women might not make decisions when it comes to land.

- Information identifies how farmers access information about conservation practices and from whom. Potential sources include extension services, other farmers, the MaMaSe initiative, WWF Kenya, Community Based Organizations, and Water User Associations.

Smallholder Farmer Interview Schedule and Short Survey

Essentially, the interview questions with smallholder farmers were designed to assess whether the farmers have access to these four dimensions of social capital and how this access has affected (or not affected) their use of SWC practices. Additionally, the interview questions also assessed how the MaMaSe initiative has affected these four dimensions in the community and in turn affected the adoption of SWC practices. Eight primary open-ended questions were developed based on the need to explore the four dimensions. In addition to social capital, questions related to farmer perception and the presence of a shared future among farmers were included in the interview. Flora et al. (2016) and Webb and Cary (2005) describe that a shared future is essential to building social capital and thus, farmers were asked about the future they saw for their farms, their community and SWC practices.

Dunn (2010) states that primary questions are used to begin a discussion or introduce a new topic while prompts are used to further the discussion. Prompts were incorporated into most of the questions on the interview schedule. The key informant interview included a few additional questions based on what I heard in the other 24 interviews. See Appendix A for full smallholder farmer and key informant interview schedules. All interviews were recorded and extensive field notes were also taken during the interviews. After each interview, the farmers gave me a tour of their farms. In this setting, I participated in informal conversations with the farmer and my key informant. These conversations sometimes yielded further relevant information which was also included in the interview notes.

After each interview, the farmers were provided with a short ten question written survey which consisted of seven closed-ended questions and three open-ended questions. The survey gathered demographic data and information on housing characteristics (i.e. gender, age, family size, education,

main source of income) and farm characteristics (i.e. farm tenure, length of tenure, farm size, types of crops grown, the presence of livestock). A copy of the survey is provided in Appendix B.

MaMaSe Partner Interview Schedules

Interviews with WWF Kenya and SNV staff members were conducted after the interviews with the smallholder farmers. These interviews were conducted over Skype as WWF Kenya and MaMaSe staff were not on-site when I was collecting data in the field. Questions were developed using recommendations from the World Bank (see Dudwick et al., 2006). While predefined interview schedules were developed for these interviews, additional prompts were included based on the responses of the smallholder farmer interviews. For example, many of the farmers talked about specific training sessions and events with SNV. The SNV interview thus contained questions to gather more information about the specific events mentioned by smallholder farmers. See Appendix C for full interview schedules for both staff members. Interview schedules include all interview questions and prompts.

Pre-testing

The farmer interview schedule and survey instruments were pre-tested before being used in the field. When the smallholder farmer data collection instruments were initially developed, African students at Kansas State University with rural farming backgrounds were recruited to participate in pre-test interviews. One student from Kenya and one student from Eritrea participated in the interviews. The students were asked the questions as they were intended to be asked to farmers in Merigi Ward, however, questions pertaining to the MaMaSe initiative were not asked during this initial testing phase. Based on the results of these pre-test interviews, questions were modified to remove repetitive and leading questions and ambiguous wording. The data from these interviews were not included in the study and were used solely for making modifications to the data collection instruments.

According to Dunn (2010), key informants can be used to help test interview design. Before going out in the field both the interview schedule (including prompts) and short survey were reviewed by my key informant during our initial meeting. In this round of pre-testing, I wanted to make sure that the language used in the interviews and survey was easily understood and culturally appropriate. Additionally, after the first five interviews, the questions were re-evaluated once again, and some slight modifications were made in regards to wording and redundant prompts. A few questions were rephrased to be more easily understood by the study participants but neither the purpose nor meaning of the questions changed.

Since WWF staff and SNV staff interviews were only used to collect supplementary information and did not undergo data analysis, the data instruments were not pre-tested. However, the interview schedule was reviewed by members of my dissertation committee for ambiguous wording and leading questions.

Language Barriers

The interview schedules were written in English, with the expectation that the interviews would be conducted in English. While previous research within the Mara River Basin (Atisa et al., 2014) was carried out in English, I did, however, encounter some unexpected difficulties. Out of the 25 interviews, 17 interviews were conducted in English, though two of these participants mixed English with some Kipsigis (the native language of the Kipsigis) or Swahili (one of Kenya's official languages). The remaining eight participants were more comfortable responding to the questions in Kipsigis. Though most of the participants were able to read English, speaking was much more challenging. In these instances, my key informant, who accompanied me to every interview, also took the role of an interpreter. During some of the interviews, my key informant would add his own view on what was being said after his interpretation. These additional thoughts provided contextual background to help me understand my

interviewee's circumstances better as they could not fully express themselves in English. Thus, my key informant was an active participant in the data collection process both by adding valuable perspectives but also in part constructing some of the data through his role as an interpreter. In the analysis of results, however, I only analyzed what was interpreted versus the additional comments of my key informant. In the transcripts, my key informant's views were attributed as his own versus a part of what the interviewee said. His presence also provided a level of comfort for my study participants (and myself) and they were able to feel at ease as they participated in the interview.

There are obvious limitations to this approach. First, my key informant is not a professional interpreter and thus does not have professional training. During our first meeting, I described the purpose and goals of the research, ethical considerations, and the role he would play in the interviews. This conversation gave my key informant an understanding of how the interviews should be conducted. I was also aware of the possibility of the "interpreter version" (Filep, 2009, p. 64). Interpreter version refers to when the interpretation differs from what is actually being said by the interviewee due to the interpreter's own worldviews and suppositions (Filep, 2009). To reduce this bias, I would repeat my key informant's response looking for confirmation from the interviewee after my key informant had interpreted what I had said. I also directed my questions directly to the interviewee maintaining eye contact as is advised in Edwards (1998) and I also assessed non-verbal cues to see if the interviewee seemed uncomfortable or showed any signs of distress. By watching the interaction between the interviewee and the interpreter the researcher can assess how the interpretation is being conducted (Edwards, 1998). None of the participants showed any signs of being uncomfortable during the course of the interviews.

Squires (2009) describes the use of oral translations in the audio for the transcription as a disadvantage to the data analysis process. It is important to note, however, that methodological choices are related to the resources that are available to the researcher (Temple & Young, 2004). Funding and

time constraints limited my ability to use a professional service to translate and transcribe the eight interviews and so I had to rely on my key informant's interpretations for the transcripts. Furthermore, finding qualified translators that know Kipsigis was difficult to secure. While I can't remove the disadvantages from this approach, the interpretations were said and transcribed in the third person. The use of the third person in the interpretation and transcription of the interviews acknowledges that the translations are "in part constructed by the translator" (Temple & Young, 2004, p.170). Using the third person acknowledges that my key informant made the interpretations rather than stating that the translations were literal which would be a false assumption.

I also conducted a comparison of the transcripts and there were no marked differences in content or tone between the English speakers versus non-English speakers whose interview had been orally translated. If anything, a certain richness was lost from the interpretation. During one interview, my key informant did turn to me and say he wished I understood Kipsigis as I could get a better grasp on what was being said and understand the nuances of their language. While language is an important part of the methodological approach and data analysis, it is not the subject of my research. In Riessman's (2000) study, where she does not speak the language of her research subject's, her data analysis focuses on presenting her understanding of the interview transcripts and making her process clear to her audience. Riessman's approach reinforces to the reader that her analysis is her view on what the translator has provided rather than trying to attach meaning to a language she doesn't understand (Temple & Young, 2004). Riessman (2000) states: "I also attend to the sequence of and contexts in which the topics appear in the interview, how they are talked about, and my shifting understandings of them," (p. 130). Similarly, I was more interested in analyzing the experiences and situations that had taken place in relation to SWC practices and the community. In the results section, I present my understanding of the experiences, motivations and events as they are presented in each interview rather than try to glean or attach meaning to the words said in the interviews. Where translations were needed, in my

view, the experiences of the interviewee were adequately described by my key informant to provide enough data to answer my research questions with the recognition that these interpretations were partially constructed by my key informant.

Data Analysis Techniques

Transcription

Transcripts were created using NVivo Qualitative Software (NVivo 11 Plus for Windows). Recorded data was uploaded and saved as an NVivo project. Using the transcribe tool, the recorded data was transcribed in English directly into NVivo and saved. To identify the speakers in the transcript, the letter 'P' was used to identify the interviewee and my initials (EM) were used when I spoke. 'KI' was used to identify my key informant. Long pauses and linguistic fillers (such as um) were not transcribed to allow for ease of reading. Opening and closing pleasantries and side conversations that did not have any relevance to the interview were not transcribed. After the initial transcription, each transcript was re-read while listening to the audio to check for any transcribing errors. Once the transcription was complete, NVivo was also used to code the data. Each transcript was pre-coded and followed by two coding cycles (described below).

Coding

Coding is a qualitative data analysis technique that refers to the use of a word or phrase to symbolize or capture the meaning of a section of data (Saldaña, 2015). Coding is generally used on language based or visual data (Saldaña, 2015). Saldaña (2015) suggests starting the analysis of transcripts by pre-coding the data. When pre-coding transcripts, important or significant sections in the text are identified (Saldaña, 2015). Each farmer transcript was pre-coded and nine main topic areas or

broad codes were developed. These broad codes are not analytical but were simply a way to organize passages based on similar information. The nine broad codes include:

- Erosion problems
- Experience with erosion practices
- Groups in the community
- Interaction with MaMaSe
- Community collaboration
- Laws and rules
- Safety
- Information about agriculture
- Shared vision and future

Passages containing information relevant to a broad code(s) was saved under the relevant broad code. For example, if a participant spoke about attending a MaMaSe training or event, that passage was coded to the "Interaction with MaMaSe" broad code. If a participant discussed anything related to using SWC practices, that passage was coded to “Experience with erosion practices.” After pre-coding the data, the selected passages in each broad code were coded using a “first-cycle” (Saldaña, 2015, p.67) coding method.

First Cycle Coding

Saldaña (2015) describes qualitative analysis as “cyclical” (p. 67). Coding involves constant comparisons between codes and categories to improve the analysis (Saldaña, 2015). Saldaña (2015) outlines various first cycle coding techniques. To decide the most applicable approach to one's study, Saldaña (2015) suggests looking at the "nature" of one's research. That is to say, you should determine whether your research questions have ontological origins (exploring the nature of a person’s reality) or epistemological origins (understanding a phenomenon). The research questions guiding this dissertation are epistemological in nature, as they seek to understand how social capital influences the adoption of SWC practices—the phenomenon at hand. Saldaña (2015) provides a variety of coding techniques that are more applicable to analyzing epistemological questions including initial and process coding.

Initial coding can be used in any qualitative study and "breaks down qualitative data into discrete parts, closely examines them, and compares them for similarities and differences" (Saldaña, 2015, p. 295). Initial coding allows the researcher to consider and reflect on the data at hand (Saldaña, 2015). Passages from the transcripts were broken down and analyzed in detail to reflect on how the phenomena of interest, social capital, is being revealed in the data. Initial coding is flexible as it allows for the integration of other coding methods such as process coding and in vivo coding (Saldaña, 2015). In vivo codes use the interviewee's own terms or phrasing (Saldaña, 2015). While process codes refer to the use of "gerunds (-ing words) exclusively to connote observable and conceptual action in the data," (Saldaña, 2015, p. 296). Both in vivo and process codes were developed during this first round of data analysis. A few descriptive codes were also produced during this coding cycle.

Saldaña (2015) states that your chosen coding techniques should be piloted to see if they are appropriate. During this first coding phase, the coding techniques (initial, process and in vivo coding) were tested on the first three interview transcripts to see their applicability and whether they provided insights that help answer my research questions. The chosen coding techniques were found to shed light on the epistemological inquiry of this dissertation. In vivo and process codes in this first phase of coding were able to symbolically express the experiences of the interviewees which allowed me to identify how social capital was accessed by each individual.

Second Cycle Coding

The first coding cycle produced more than 100 codes and so a second-cycle coding technique was used to help organize and find themes within the data. Second cycle coding methods are generally used to reorganize and reanalyze qualitative data (Saldaña, 2015). Saldaña (2015) states that a second cycle coding can help make "sense of categorical, thematic, conceptual, and/or theoretical organization from your array of first cycle codes" (p. 233). Pattern coding was chosen as the second cycle method for the analysis. This type of coding involves identifying similar codes and organizing them into categories to

develop a “meta-code” (Saldaña, 2015, p. 235). Seventeen meta-codes were produced from this process. Pattern coding also helps "attribute meaning" to the organization (Saldaña, 2015, p.235). Thus, as the categories or meta codes were developed and associated with meaning, themes began to emerge. The results of both coding phases will be discussed in detail in Chapter Four.

Code Maps and Analytic Memos

To aid in the development of themes, code mapping and analytic memoing were integrated into the analysis. Code maps can help increase the trustworthiness of the analysis by documenting and displaying the logic behind the development of final themes (Saldaña, 2015). As the codes were categorized into the 17 meta codes and then into themes, the codes were diagrammed to show relationships and connections between the codes, categories and developed themes. Analytic memoing accompanied both the first and second cycle coding processes. Analytic memoing involves writing down reflections about the coding process and how patterns, themes and concepts emerge from the data (Saldaña, 2015). Charmaz (2006) states that memoing allows the researcher to compare data, codes, and emergent themes and gain a better understanding of the data: “Writing successive memos throughout the research process keeps you involved in the analysis and helps you to increase the level of abstraction of your ideas” (p. 72). After each code was created a memo was written to describe how the code emerged. A description of the code was also included in the memo. As patterns emerged from the data through both coding cycles, memos were written to describe what was being observed in the data. In conjunction with the code map, memos were written to explore connections between codes, categories, and patterns to form the final themes.

Addressing Validity

Qualitative methods have had to be justified in a scholarly environment where observation and measurement are valued higher (Winchester and Rofe, 2010). Winchester and Rofe (2010) state that proponents of the qualitative approach have three basic arguments in defense of qualitative methods:

1. Though studies of individuals, places or events lack generalizability to the larger population, they have meaning in their own right, even though they are not representative or replicable.
2. Some large-scale qualitative studies have generated enough data to draw some general conclusions and quantifications.
3. Qualitative research has been justified as a complementary technique and can be used with or before quantitative research where generalizations can be drawn or provide greater depth.

Qualitative researchers are finding techniques to use that counteract some of the weaknesses associated with the qualitative approach. They recognize that qualitative methods have value without the need to be more like their quantitative counterparts. The discussion below focuses on researcher bias and the steps taken to alleviate some of the associated problems. Issues related to generalizability will be addressed in the final chapter of this dissertation.

Researcher bias

Maxwell (2013) states that researcher bias and reactivity are the main validity threats to qualitative research. Johnson & Onwuegbuzie (2004) agree stating that a major criticism of qualitative research is that the interpretation of data is more easily affected by personal bias. Researcher bias refers to the researcher's subjectivity, that is the "theories, belief and perceptual lens" that influence the research (Maxwell, 2013, p. 124). Reactivity refers to the effect the researcher has on the researched (Maxwell, 2013). Maxwell (2013) argues that it is impossible to entirely remove subjectivity

from qualitative research. Instead, qualitative researchers should seek to understand how one's subjectivity influences how the study was conducted and subsequent data analysis (Maxwell, 2013).

One way to address researcher bias and reactivity is by exercising "critical reflexivity" (Dowling, 2010; Maxwell, 2013). Dowling (2010) draws from England (1994) defining critical reflexivity as "a process of constant, self-conscious scrutiny of the self as researcher and of the research process" (p. 31). Dowling (2010) states that critical reflexivity helps a researcher "identify the implications of subjectivity and intersubjectivity in your research," (p. 35). England (1994) agrees with Maxwell (2013) stating that we can't hide behind the guise of being a professional researcher, fieldwork in and of itself is personal. It is important to "locate ourselves in our work and to reflect on how our location influences the questions we ask, how we conduct our research, and how we write our research" (England, 1994, p. 87).

Dowling (2010) suggests using a research diary to practice critical reflexivity. The diary should contain the researcher's notes on their role as a researcher and their role in the social context in which their research is based. After each day of interviewing, I journaled about the day, who I interviewed, the research process, how I asked my interview questions and lastly how I was received in the area I was in. The notes in my research diary allowed me to see how my personal biases influenced how I conducted my research and thus influenced my results. They also allowed me to examine how my presence within the social context of Merigi Ward affected my fieldwork. The main findings of my critical reflexivity exercise will be shared in Chapter 5. In addition to practicing critical reflexivity, there are certain strategies that can be used to improve the validity of one's conclusions (Maxwell, 2010). Some of these strategies include long term involvement in the study area; rich data collection; respondent validation; triangulation; and comparisons between cases. In my case, I used rich data, respondent validation and triangulation.

Maxwell (2010), drawing from Becker (1970), states that rich data refers to the collection of "detailed and varied" data that allows you to understand what is occurring (p. 126). In an interview

context, rich data refers to the use of fully transcribed data rather than researcher notes (Maxwell, 2013). As aforementioned, the interviews were recorded and transcribed word for word, only irrelevant conversations (introductions, side conversations) were left out of the transcriptions. In addition to conducting the interviews, I spent additional time with each farmer through a farm tour. The farm tours gave me the opportunity to interact with the farmers outside of the formal interview setting and observe the farmers discussing their farms and erosion problems. These conversations either lead to more revelations or provided more detail to what was said in the interview. While these conversations weren't recorded, I would take detailed notes on any significant revelations.

Respondent validation refers to making sure your conclusions and data are accurate by asking study participants to confirm the accuracy of your interpretations (Maxwell, 2013). During the interview, I would repeat the interviewees' responses and ask if what I said was accurate to remove the possibility of misunderstandings. Even with the non-English speaking interviewees, I would re-state what was interpreted and ask my key informant to interpret my understanding to the interviewee.

Triangulation refers to "collecting information from a diverse range of individuals and settings, using a variety of methods" (Maxwell, 2013, p. 128). In my case, with the help of my key informant, we identified a diverse group of people with different educational backgrounds, incomes, status within the community, men and women. It was important to capture as many female perspectives as possible as a recent past study was unable to recruit a significant portion of women (see Atisa et al., 2014).

Ethical Approvals and Data Confidentiality

The Kansas State University (K-State) Institutional Review Board (IRB) reviewed the ethical implications of the conducted research prior to data collection. Both smallholder farmer and staff interview schedules, short questionnaire, interview consent forms, and photography release forms were reviewed and approved (IRB# 8186). A research permit issued by the National Commission for Science,

Technology and Innovation (NACOSTI) is needed to conduct any research in Kenya. Per the permit application, I also had to secure IRB approval from a Kenyan university. Egerton University reviewed and approved my research. After submitting all the required paperwork, I received a research permit from NACOSTI (Reference No: NACOSTI/P/16/21543/11128) to conduct research in Bomet County. Once in the field, I met with Bomet County Director of Education and the Bomet County Commissioner to explain my research and gain their approvals before proceeding with the interviews. See Appendix E for approvals from K-State, Egerton University, NACOSTI and government officials.

Before starting each interview, the study participants were provided with an interview consent form and a photography consent and release form. While most participants did not have trouble reading the consent forms, a few participants who could not read English well received help from my key informant. He would go through both the consent and photography release forms step by step in Kipsigis before the participants signed the forms. WWF Kenya and SNV staff were provided with a consent form via email.

All the recorded interviews were downloaded onto a password protected laptop once the interview was completed and the data on the recording devices were deleted. A digital photo was taken of all the consent forms and stored on a password protected laptop while the study participants remained with physical copies. Field notes and the questionnaires are stored in a secure room. Transcripts are only in digital form and are saved on a password protected laptop. The names of the study participants will remain confidential and will not be reported in subsequent chapters of this dissertation or in future publications.

Chapter 4 - Results

Introduction

As I listened to each of the interviewees discuss their experience with soil and water conservation (SWC) practices and access to social capital, patterns began to emerge but remained unclear. The use of coding made those patterns apparent and more concrete. This chapter discusses the findings of the coding cycles and presents the final themes. The first coding cycle produced more than 100 codes (see Appendix D for the list and description of codes). A second coding cycle was used to condense the codes into meta-codes and subsequently develop themes. The meta-codes and final themes are presented here. See Chapter 3 for a more detailed description of the coding cycles used. Excerpts from the two MaMaSe partner interviews were used to supplement findings. First, the results of the short survey are presented to provide a demographic picture of the study participants.

Results of short survey

The short survey collected data related to demographic and housing characteristics. Table 4.1 provides a summary of this data. Of the 25 smallholder farmers who were interviewed, 18 were men and 7 were women. Most farmers were between the age of 35 and 64. Only one participant was below the age of 35, and three farmers were above the age of 65. Thirteen farmers stated that their highest level of schooling was secondary education while five farmers only attended primary school. Five of the farmers had attended university, and two farmers reported they had not received any formal education. Most study participants had large household sizes with 17 participants reporting a household size of six people or larger. Sometimes family members extended beyond the immediate family. One elderly farmer explained that he had become the guardian of children who had lost their parents:

> One may have about two children or three children. But me I [am] occupied, involved [with] some orphans... I have some orphans. I call them grandchildren [laughs]. I am now a guardian.

Table 4.1 Summary of short survey results

Gender	Count
Male	18
Female	7
Age	**Count**
18-34	1
35-44	6
45-54	8
55-64	7
65+	3
Education	**Count**
No Schooling	2
Primary School	5
Secondary School	13
University	5
Main source of Income	**Count**
Farming	16
Livestock	1
Farming and Livestock	8
Household Size	
3 - 5 people	8
6 - 7 people	12
8+ people	5
Tenure	**Count**
Purchased farm	12
Inherited farm	13
Top 5 Crops Cultivated	Maize, Beans, Tea, Potatoes, Bananas
Average Farm Size (acres)	4.2
Average Time of Ownership	22 years
Own Livestock	25

Smallholder farms in the Mara River Basin are generally between 3 – 5 acres in size (WREM International Inc., 2008). Of the farms I visited in Merigi Ward, 18 farms were between 3 – 5 acres. The smallest farm I visited was approximately 2.2 acres while the largest farm was approximately 10 acres. The average farm size was 4.2 acres. Most study participants had been farming their land for more than

ten years. Sixteen farmers had owned their farms for 20 years or more while one farmer stated he had been working his land for 50 years. Only two farmers reported owning their land for less than ten years.

Tenure has been researched in numerous adoption studies. Secure tenure is seen as a positive influence on the adoption of SWC practices by several authors (Gebremedhin & Swinton, 2003; Teshome et al., 2016a; Kassie et al., 2015; Kassie et al., 2013; Abdulai & Huffman, 2014; Kabubo-Mariara, 2007; Nyangena, 2008). While tenure was not evaluated in this study, it was still important to collect data on land ownership and discuss tenure during the interviews. About half of the participants inherited their land from their family while the other half purchased their land. None of the farmers alluded to renting their farms. One farmer explained that inheritance of land is a common feature in their culture:

> But it is common in our culture that after the lifespan of the parents, the children inherit the land. They do farming also [and] they give [the farm] to the [next] generation.

Some participants discussed gender in relation to land ownership. Out of the adoption studies that were reviewed in this dissertation, four found gender to be non-significant while two found gender to have a significant influence on adoption. The two studies with significant results found that being male positively influenced adoption (Mazvimavi & Twomlow, 2009; Marenya & Barrett, 2007). During the interviews, a few study participants explained that land culturally belongs to men among the Kipsigis tribe. This finding agrees with discussions from Atisa et al.'s (2014) Mara River Basin study. Generally, land is divided and given to the sons of the family. If a woman remains unmarried, it is then possible for her to inherit land from her father. One participant explains:

> I have five sons and three daughters. So, in case of the daughters not getting married they will need [a] part of it. But mostly in our place, the sons inherit the land. My last born completed form four last year, [and] she's a girl... The arrangement has been… Girls only get the share of the father's property when they are not married. So at the moment, I assume, because all of them they are not married, I assume that [a] piece of land [will] be inherited by them.

When asked about the future ownership of the farm, most participants didn't differentiate between sons or daughters but just stated their children would continue ownership of the farm. Three study participants, including the farmer above, specifically said their sons would inherit the land. My key informant recognized this cultural norm but stated that he didn't plan to follow this rule when asked who would take over his farm. My key informant explains:

> **Interviewee:** Yeah, the children. Children without, you know… Gender bias!
> **Elizabeth Musoke:** [laughs] No gender bias.
> **Interviewee:** If my daughters will not have where to go, they'll stay on the farm. To carry out the activities that will be possible there.

Income has had both negative and positive influences on SWC practice adoption (see Tenge et al., 2004; Teklewold & Koehlin, 2011). All study participants stated that their main source of income is either from farming or livestock rearing or a combination of both. One farmer explained:

> When you talk of my people around the community, I should say mostly all of us are farmers. In fact, everybody is a farmer. The only difference is I may be a dairy farmer; somebody else can be doing tea, somebody else can be doing even potatoes. But generally, I should say over 99% of us are farmers.

A few of farmers had had previous careers in teaching, government, and the Kenyan military. In these cases, the farmers had returned home to Merigi Ward to set up farms in their retirement.

Regarding agricultural products, participants were asked to list the main crops that were grown on their farms (Table 4.2). The majority of farms produced maize (Figure 4.3), beans, tea (Figure 4.3), potatoes and bananas. Other crops included millet, sorghum, cabbage (Figure 4.2) and pyrethrum (Figure 4.1). Substances present in pyrethrum flowers are used to develop insecticides (Pyrethrum Board of Kenya, 2001). Every study participant owned livestock, particularly cattle, even if livestock wasn't the main source of income. One of the main products in Merigi Ward is milk. Milk is the main commodity marketed by the Merigi Farmers' Cooperative.

Table 4.2 Crops grown by study participants

Crop Type	Number of Farms with Crop
Maize	25
Beans	24
Tea	19
Potatoes	19
Bananas	11
Sweet Potatoes	6
Onion	4
Peas	3
Avocado	2
Millet	2
Cabbage	1
Papaya	1
Sorghum	1
Pyrethrum	1

Figure 4.1 Harvested pyrethrum flowers (Source: Photo by Author)

Figure 4.2 Cabbage crops (Source: Photo by Author)

Figure 4.3 Tea (foreground) and maize crops (background) (Source: Photo by Author)

Pattern Coding Results: Meta-codes

The smallholder farmer interview schedules were divided into three parts. Part one collected data related to farmer perception of erosion and the use of erosion controls. The second part of the interview explored the four dimensions of social capital (groups and networks, information, trust and reciprocity and formal and informal rules) in relation to SWC practices and the MaMaSe initiative. Part three assessed what each farmer saw for their farm's future and that of the community. Each part was broken down and analyzed using initial, process and in vivo coding. This first phase produced 125 codes and it was difficult to draw any valid conclusions. Thus, pattern coding was utilized to organize the data and subsequently produced 17 meta-codes. The meta-codes and their descriptions follow:

- **Meta-code 1 - The importance of groups in helping one another:** Groups, such as the Merigi Farmers' Cooperative (MFC), women groups, community-based organizations, were a prominent feature among conversations with the interviewees. Groups provided support in a variety of ways (e.g. financial assistance, transportation). All participants belonged to at least one group within Merigi Ward. Codes related to participating in groups and finding support or giving support through group activities were categorized under this meta-code.
- **Meta-code 2 - The need to work together:** In vivo codes including "Cannot succeed alone," "Unless we come together," "To make work easy" were categorized under this meta code. In vivo codes use the words or phrases spoken by the participants in the interview. The passages associated with these in vivo codes speak to the saying "strength in numbers" where people turn to each other for support when working in the fields and collaborating to address community problems or activities.
- **Meta-code 3 - Strength of Bonds:** There is a strong sense of community within the ward. From informal conversations, observations and responses to the interview questions the participants seemed to be part of a close-knit community. Participants felt safe within their community,

trusted others and collaborated with each other when faced with community problems. Prominent codes in this meta-code include: “Feel safe” “We tend to protect ourselves” “Call each other to discuss” and “We all participate.”

- **Meta-code 4 - Environment of Learning and Teaching:** As the MaMaSe initiative and other organizations introduced information and guidelines, conducted training sessions and other activities, the farmers also disseminated information amongst themselves while educating one another. The result was an environment of community learning and encouragement. Codes related to learning from the MaMaSe initiative and disseminating information among other farmers were placed under this meta-code. Prominent codes include: “Encouraging each other” “Helping each other” “Telling” “Learning.”
- **Meta-code 5 - Access to Diverse Networks:** Study participants accessed information about SWC practices or general information relating to farming from a variety of organizations or individuals. While the Merigi Farmers’ Cooperative was mentioned the most, neighbors, Ministry of Agriculture, MaMaSe initiative partners, and village leaders were also discussed. Through MaMaSe events, some interviewees discussed that they met farmers from other areas and exchanged ideas or experiences with them. Codes that identified interactions with organizations and other farmers within and outside Merigi Ward were categorized under this meta-code.
- **Meta-code 6 - Improved guidelines from MaMaSe initiative partners and other organizations.** The majority of the study participants stated that the MaMaSe initiative, in collaboration with the Merigi Farmers’ Cooperative, provided more detailed and personalized information related to SWC practices. Participants also had a chance to interact with MaMaSe partner staff members thus building relationships with the consultants hired to educate them. Codes related

to interacting with MaMaSe partners and access to better information were categorized under this meta-code.

- **Meta-code 7 - Belief in a better future with SWC Practices:** Study participants stated that they see a better future if they continue using SWC practices and continue to implement what they had learned from the MaMaSe initiative. They have seen increased productivity leading to better incomes thus establishing a more secure future. Farmers also discussed the intention to diversify activities on their farms to access more opportunities and increase income. Prominent codes in this meta-code include: “Generate some income” “Improve productivity level" "Prosperous future" "Diversification."
- **Meta-code 8 - MaMaSe instills a conservation outlook:** Related to meta-code 7, farmers expressed that environmental conservation was a priority and a necessity to better their livelihoods. This outlook can be attributed to the detailed guidelines, teachings, and influence of the MaMaSe initiative. Codes discussing the help received from MaMaSe and MaMaSe’s influence on their perception of environmental conservation were included under this meta-code.
- **Meta-code 9 - Sharing Future Plans:** Study participants were asked whether they intended to share future plans for their farms with others. Most participants stated that they are encouraging others to implement SWC practices, but the majority were not actively sharing their erosion control plans with their neighbors.
- **Meta-code 10 - Won’t move anywhere.** When the study participants were asked whether they would leave their farms in the future, the overwhelming response was no. Most of the farmers (n=17) said they were not planning to leave their farms but were ready to invest in them.
- **Meta-code 11 - Perceived processes, effects and consequences of erosion.** It was evident the study participants had a good understanding of what erosion was, and the detrimental effects

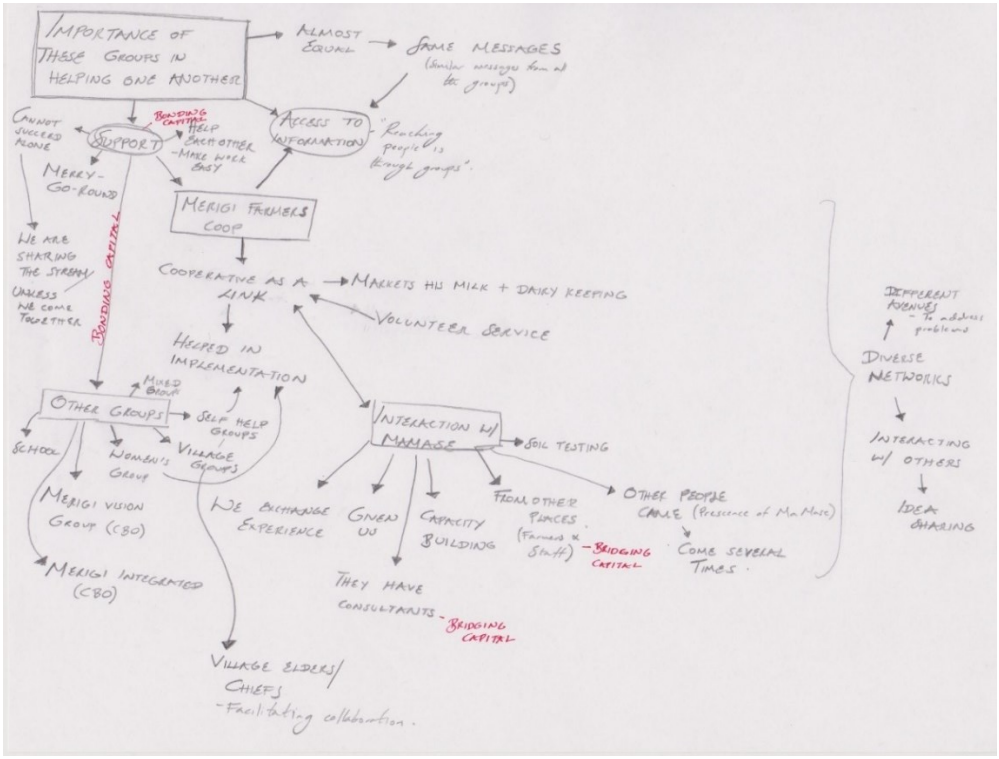
erosion had on soil fertility and crop productivity levels. Prominent codes in this meta-code include: “Soil was becoming infertile” “Carries the soil” “Crops are also swept by water” “Remain with nothing” (i.e. no crops were produced).

- **Meta-code 12 - Man-Made Effects:** While participants understand erosion is exacerbated by steep slopes and the lack of SWC practices, some farmers also discussed runoff from roads and structures that are adjacent to farms as a cause of erosion. Additionally, a few farmers mentioned that the footpaths used to transport livestock to a water source contributed to erosion within the community. The codes within this meta-code include: “Footpaths” “Runoff from the road” “Runoff from roofs of the buildings.”
- **Category 13 - Perceived benefits of Erosion Controls:** With Merigi Ward experiencing extensive erosion, farmers had to implement erosion controls as they understood the link between erosion and diminished soil fertility. These adopters have seen the benefits of SWC practices, particularly, improved crop productivity. Codes related to perceived benefits of SWC practices were placed under this meta-code.
- **Category 14 - Revival of SWC Practices:** This meta-code consists of only two codes: “Revival” and “Old Structures.” Three farmers recalled that their fathers had put in erosion control structures, but they had not been maintained through the years. The old erosion control structures were still present on some of the farms, reiterating that erosion control is not a new concept in the area. One participant stated that in recent years there was a revival of erosion control use led by the Ministry of Agriculture and WWF Kenya.
- **Category 15 - “The policy is there:”** Study participants were asked to list any government soil conservation guidelines or laws they knew. Twenty-one of the interviewees could recite at least one regulation. This meta-code refers to the fact that most participants are at least vaguely aware of government regulations or guidelines related to SWC practices and erosion.

- **Category 16 - Government Inaction/Action:** The codes in this category refer to any mention of involvement or lack of involvement from government agencies in the dissemination of information related to SWC practices.
- **Category 17 - Access to the markets:** Two participants mentioned that there is a need to satisfy market demands. Codes from these two discussions were categorized under this meta code.

Through code mapping and diagramming, connections between each meta-code and codes were explored. See Figure 4.4 for a partial example of the code map diagram. The final two meta-codes (government inaction/action and access to markets) did not explicitly answer the research questions and were removed from the final list of meta-codes. Thus 15 meta-codes were used to develop the final themes. Two codes that discuss poverty and unemployment in the community were left uncategorized. The passages in these codes, however, shed light on the issues of poverty in the ward.

Figure 4.4 Example of a code map diagram used to develop codes, meta codes and final themes (Source: Photo by Author)



Final Themes

Using the code map diagrams above the meta-codes were further collapsed to determine the final themes. Five final themes were developed and are listed below with their corresponding meta-codes. Similarities between the meta-codes were used to develop the final themes. For example, the four meta-codes under Theme 2 (The importance of groups) contain codes that refer to the benefits of groups within Merigi Ward. As an example, within Meta-code 1 study participants discussed the support they receive from their groups, while in Meta-code 6 study participants talked about receiving information from their groups. Theme 2 demonstrates that groups provide support to individuals in the community and act as conduits for information.

- Theme 1: Strength of community bonds
    - Meta-code 2: The need to work together
    - Meta-code 3: Strength of bonds
- Theme 2: The importance of groups
    - Meta-code 1: The importance of groups in helping one another
    - Meta-code 2: The need to work together
    - Meta-code 3: Strength of bonds
    - Meta-code 6: Improved guidelines from MaMaSe and other organizations
- Theme 3: Information
    - Meta-code 5: Access to diverse networks
    - Meta-code 6: Improved guidelines from MaMaSe and other organizations
    - Meta-code 15: "The policy is there."
- Theme 4: Community Learning
    - Meta-code 3: Strength of bonds
    - Meta-code 4: Environment of Learning and Teaching

    - Meta-code 5: Access to diverse networks
    - Meta-code 13: Experienced benefits of erosion controls
    - Meta-code 14: Revival of SWC practices
- Theme 5: Positive Outlook
    - Meta-code 7: Belief of a better future with SWC practices
    - Meta-code 8: MaMaSe instilling a conservation outlook
    - Meta-code 9: Sharing Future Plans
    - Meta-code 10: Won't move anywhere
    - Meta-code 11: Perceived processes, effects and consequences of erosion
    - Meta-code 12: Man-made effects
    - Meta-code 13: Experienced benefits of erosion controls
    - Meta-code 14: Revival of SWC practices

These final themes are described in more detail below.

Theme 1 – Strength of Community Bonds

Strong bonding capital fostered by high levels of trust and reciprocity within the community allows for an environment where community members are willing to collaborate with each other to address communal problems. During the interviews, study participants were asked to discuss features of trust and reciprocity within their community and community collaboration. From the interviews and observations, it was clear that strong bonding capital was a noticeable feature within Merigi Ward.

Feeling of Safety

To assess trust within the community, participants were asked to discuss how safe they felt within Merigi Ward. Siegler (2014) suggests that asking participants about their perception of safety allows one to assess how each participant trusts others within their community. All of the study

participants stated that they did not have any significant safety concerns and expressed that they felt safe within Merigi Ward. Three interviewees stated that compared to other communities in the basin, that experience crimes such as cattle rustling, Merigi is safe. The crimes experienced within the ward are not as severe. One farmer explained:

> In our community, we stay in a very good harmony. We don't have problems in the area, compared to other areas where you find that people are fighting because of cattle rustlers, things of that nature. But here within, we don't have that kind of behavior.

In one instance, a participant discussed safety from a tribal perspective. He explained that the majority of people living in the ward were a part of the Kipsigis tribe and there is security and familiarity in being with people like oneself. This perspective indicates strong bonding capital through tribal affiliation. The farmer stated: “So generally we are the Kipsigis and we are secure within and without.”

Merigi Ward is not without crime. Three of the study participants stated that the crimes experienced in the ward were related to poverty and unemployment. One participant described his thoughts on poverty and safety:

> You know, I think poverty is an issue. So if people are poor they tend to give up in life, and the only thing they can do is "If I have to survive I cross to my neighbor [and] steal." That is when [they] can get something to eat or something like that. But it is not justified. Poverty can bring about the issue of insecurity. Poverty is something which is not good. You know, you have to do something on your own to eat, but you don't have to steal from your neighbor to eat. It is not good. But because of that poverty level, people are hopeless in life, and they can steal. When they are desperate, they can break into houses to steal and they can do all those things.

Similarly, two participants discussed safety from the perspective of unemployment. Essentially, both participants alluded to the fact that the lack of employment may lead to the theft of farm produce. One interviewee described those without work as “idlers” who take advantage of thriving farms to steal food.

While there are no major security problems, community members rely on themselves and the government to provide protection and security. Families within the ward are extremely familiar with

one another to the extent that it is possible for the community to deal with issues of safety on their own. Two participants discuss this below:

> But one thing I like… Security [is] on our own - the community. We tend to protect ourselves in one way or other. So if there is an issue, we raise a call, alarm. And we can help one another.
>
> We don't sometimes… We don't call the government to come and assist us. Because we know they are our families within. And we know that family does not work, that family does not… We know ourselves within the community.

From another perspective, some study participants stated that strong ties and trust between households had been enhanced by the government. Five participants discussed that they feel the government provides sufficient security within the ward. Three of these five participants mentioned the government's *Nyumba Kumi* initiative. My key informant described that under the *Nyumba Kumi* government program (*Nyumba Kumi* translates directly to ten homes), families from ten households get to know one another and thus strangers who come into the vicinity of these households are easily recognized. From my experience in Merigi Ward, it was clear that I was an outsider. In one incident, it was raining and I was waiting under a shelter at the entrance of a study participant's home. A man was waiting under the shelter as well to get out of the rain. I tried to say hello but I did not receive an answer. It was only until my key informant arrived that the man felt comfortable enough to talk me. It was clear to him that I was a stranger.

Community Collaboration

Interviewees were asked to discuss community collaboration in terms of volunteerism and contributing to communal activities within Merigi Ward. The strong feeling of safety and familiarity among community members has fostered an environment where people have the ability to organize and collaborate to help one another.

In one instance, my key informant and I arrived at a farmer's home for an interview but we couldn't find her. Eventually, we asked a neighbor and we were informed that she was on another farm

working with a group of women to assist a fellow farmer. Working together seemed to be a common occurrence among the interviewed participants as 16 farmers discussed that they volunteer their time to help other farmers. Assistance may come through volunteering time or even by sharing materials or resources (i.e. reciprocity). One farmer explains:

> **Passage translated by key informant:**
> Even during [the] planting season, they come together, they go to somebody's farm, they give assistance... And then the following day on somebody [else's] farm... And even sharing resources, discussing resources.

Another farmer provides an example of how he supports others by volunteering his time and materials:

> Normally, I do donate time and maybe even the seeds of this napier grass. Because I have got a villager here, who lives next to me, so the other time he came for these splits of napier grass. He just wanted to plant on his farm. So I gave him some.

During a farm visit, I witnessed an exchange between my key informant and another farmer. The farmer stated that he wanted to give my key informant some harvested grass seeds to plant for erosion control (see Figure 4.5).

Figure 4.5 Farmer exchanging grass seeds with key informant (Source: Photo by Author)

This spirit of collaboration extends to addressing problems at the community level. Much of the problem solving within the community is facilitated through coming together to discuss issues and working with one another to find solutions. In one example, a participant discussed the need to come together to reduce stormwater runoff from adjacent roads. Farmers affected by the runoff are each called to work on a section of the road to reduce runoff and thus reduce erosion. The excerpt below is taken from my discussion with this farmer:

> **Interviewee:** Like now, the water running from the roads. You know the roads collect most of the water…[inaudible passage]. We have to share. If you all leave it, it will just make tunnels.
> **Elizabeth Musoke:** Okay. Yeah, the tunneling.
> **Interviewee:** And cause more erosion.
> **Key Informant:** On the farm.
> **Interviewee:** On the farm. But in the community we group ourselves, we share. Everybody cuts a bit, a bit, a bit, a bit.
> **Elizabeth Musoke:** So each community member takes part of the road?
> **Key Informant:** Exactly.
> **Elizabeth Musoke:** And then you try and alleviate those problems like that.
> **Interviewee:** There are some problem[s] we can just solve ourselves.

Again, this farmer alludes to the fact that some problems are handled by community members without taking the issue directly to government entities. Similarly, another farmer gave the example of repairing footpaths as a community activity but with the help of village elders or leaders to coordinate efforts. He states that regular meetings aren't held, but when there is a problem the elders are notified and assist with coordination:

> We don't have regular meetings, we normally only use these administrators like the village elder. We normally inform him to call the neighbors where we do some communal work and try to improve our footpaths. We normally dig some ditches to [inaudible]... Cut off [drains].

Five participants pointed to the help of village elders or chiefs when dealing with community problems. In another example, one farmer described that village chiefs and elders are actively involved in addressing environmental challenges in the community:

> **Interviewee:** In fact, the chiefs and the elders of the area, they have assisted quite a lot, in discussing [these] concerning erosion and water problems.
> **Elizabeth Musoke:** So they are also involved in the discussions.
> **Interviewee:** Yes, of course. They are not bad people!

Eighteen participants stated that meetings with neighbors or other community members were used to address problems within the village or ward. Community meetings can take place in a number of settings including a person's residence. In other instances, a *baraza* can be conducted in a central market area, church or other public space. *Baraza* is the Swahili word for public meeting place. Four interviewees mentioned the use of *barazas* to discuss community issues. One of these meetings was observed during my site visit, where a large group of community members had gathered in the village center to discuss some issues that had arisen in the community. My key informant, as a former village leader, was called to give his opinion on the matter. Another *baraza* was held at the Merigi Farmers' Cooperative building. This meeting was specifically related to soil and water conservation.

Two farmers described the use of government entities rather than community meetings to help deal with community issues. One farmer explained that there are a lot of options when it comes to dealing with problems:

> **Interviewee:** Here in Kenya we have a new system. [A] devolved system. So we have administrators, we call them ward administrators. Community administrators. Area administrators. All those people, whenever there is need in a particular area, we organize together, we have a meeting, we address the issue or they address the issue. We can even go the political line also. We have the councilors, they call themselves MCAs – with the new system now they are calling themselves MCAs. So an MCA is in charge of the ward. So we can have a discussion together. Whenever an issue crops [up] and we need to discuss [it] with them, we can organize for a meeting and we come together, we address the issue.
> **Elizabeth Musoke:** Okay, so there are many different avenues.
> **Interviewee:** Yeah, there are so many avenues where you can solve issues.

In another instance, one farmer looked at problem-solving from a hierarchical perspective. That is to say, if communal problems can't be solved by community members themselves, the elders and chiefs are called in to facilitate the interaction. And if the elders are unable to resolve the issue the pertinent government representative or official is involved.

Interviewee: Yeah. You see now, in case of my family, maybe I will go to my elder brother and then maybe those close [family members]. And [I] just inform [them] and then we set a date, come and handle the problem. If it is not possible, now you go to the community... The elders and such. Then you inform them, they come. If it is solved, that is fine. If it is not solved, now you-
Elizabeth Musoke: Then you go to a higher-
Key Informant: Go ahead. Go ahead.
Interviewee: Yeah, that is how it is done.

Summary

It is apparent that the people within Merigi Ward are part of a close-knit community where community members know one another and depend on each other on a daily basis. Strong bonding capital amongst the farmers has helped to facilitate collaboration amongst individuals and collaboration within the community. A feeling of safety (implying high levels of trust) has also encouraged community collaboration. When facing problems that affect the community, most study participants stated they come together through meetings between neighbors or call for a *baraza* (public meeting) to discuss possible solutions. Community collaboration is also facilitated by social structures in the community where elders and village leaders help coordinate efforts to address communal problems including the environmental challenges facing farmers in Merigi Ward.

Theme 2 - The importance of groups

Groups provide a way for individual community members to accrue benefits that would be more difficult to access as an individual. Since many individuals within Merigi Ward rely on one another for support, groups were created to provide for greater assistance. Interviewees mentioned a multitude of benefits that can be accrued from their groups such as financial support. Along with monetary and personal support, groups have the ability to gain access to information and increase bridging and linking capital. Strong bonding capital within Merigi Ward is also evidenced by the multitude of groups that have formed within the community to provide support. All study participants belonged to at least one

group. The most mentioned groups by the farmers include: the Merigi Farmers' Cooperative, community-based organizations, women groups, mixed gender groups, and self-help groups.

In times when money is scarce or there are extra expenses, community members can turn to their groups for financial support to provide school fees or money to pay medical expenses. Six study participants discussed being a part of a "merry-go-round." A merry-go-round is a collection of people that contribute money to a common pool. This pool of money is used to support those who have a financial need. Merry-go-rounds are usually facilitated in a group setting as one farmer states:

> So we have got one [inaudible], it's called Kasset Welfare Group. So in this group, we have got a number of activities. One we normally participate in [a] merry-go-round. I hope you understand merry-go-round... We have [monetary] collections.

In other instances, people come together during a fundraising event to raise money for those that need assistance. A fundraising event is called "harambee" which is the Swahili word for "pull together." In the excerpt below one farmer discusses the importance of groups in terms of pooling resources:

> Even in our place here we have what you call "harambee." Pulling together maybe for school fees purposes. So that is part of why we form those groups. It has assisted us in putting up or taking the children to school, high school or maybe university.

Some of the groups discussed by the participants are also concerned with poverty alleviation and improved well-being. One participant stated that his church group not only provides fundraising support but also provides counseling assistance: "When it comes to counseling, you find these days, most of the people are stressed, so as a church we normally visit some of our members. We advise them on how to go about their problems." In another scenario, two farmers described being a part of the Merigi Vision Group – a community-based organization. One participant stated the Merigi Vision Group was formed to bring people out of poverty: "The initial meeting was intended for bringing people up to a certain level. So I was interested because... I wanted to see every member come to a certain level." By certain level, the participant means raising incomes and the standard of living. As a part of improving

well-being, many of the groups understand the link between preserving the natural environment and income.

Since farming is the main source of income for most families in Merigi Ward, community groups are encouraging environmental conservation as a way to help farmers attain better yields on their farms which lead to improved profits. The groups realize unsustainable practices degrade the environment and lower agricultural productivity. Four farmers mentioned that they were a part of the Merigi Integrated Development Project, another community-based organization. This group has been directly involved in environmental initiatives including the promotion of agroforestry as one farmer explains:

> **Interviewee:** We have been working with Merigi Integrated Development Project which is has been planting trees, [inaudible] forest trees.
> **Elizabeth Musoke:** You said trees? Forest trees?
> **Interviewee:** Yeah... Agroforestry.

The Merigi Vision Group is also involved in promoting environmental conservation.

When discussing the importance of groups, one farmer pointed out that even government entities recognize the power of groups within communities and use groups to help encourage community participation and disseminate information:

> **Interviewee:** Nowadays reaching people is actually through the groups… They call all the groups, they meet somewhere and we discuss the issues that may arise. At times we meet in the market or in the church doing the same. So that is actually the collaboration.
> **Elizabeth Musoke:** So you are saying even the government uses the groups?
> **Interviewee:** Yeah, they use the groups to address issues.

In terms of soil and water conservation, all groups have provided implementation support and information about SWC practices in some shape or form. The Merigi Farmers' Cooperative (MFC), however, plays an extremely important, if not the most important role in the dissemination of SWC practice information and implementation assistance within the community. MFC is the main farmer's cooperative in Merigi Ward. Most of the interviewees (n=22) were members of MFC. In some cases, a few farmers only belonged to MFC.

All participants talked well of MFC and discussed how they had found support in various ways through the cooperative. Ten farmers discussed how they had received direct help implementing SWC practices from the cooperative, while others discussed the cooperative in terms of marketing milk, receiving information about farming and SWC practices or receiving assistance when problems arose on their farms. A few adoption studies (Abdulai & Huffman, 2014; Abdulai et al., 2011; Mwangi et al., 2014; Kassie et al., 2013) have found that memberships to farmer's cooperatives or other similar groups have a positive influence on SWC practice adoption.

One of the main reasons why MFC has become the voice of SWC practices in the community is through their collaboration with the MaMaSe initiative. SNV Netherlands Development Organization (SNV), a not-for-profit international development organization, is one of the partners in the MaMaSe initiative. SNV leads MaMaSe initiative projects with farmers in the Mara River Basin providing technical assistance. To form connections in the basin, SNV chose to work with three farmer's cooperatives, including MFC. SNV's project coordinator discusses the motivation behind working with cooperatives within the Mara River Basin:

> The logic of working with a cooperative— a cooperative is a for profit organization. They actually sell a commodity, here in which case, in Merigi they sell milk. But the question was how is the commodity produced. And our thinking here, we tried to mimic what happens in the global market for fresh produce. Because for example, for Kenya, for you to export produce to Europe there are global cap standards to be met. And within the global cap standards regime, there are also environmental conditions to be met and your product will not be accepted in the European markets if they don't meet the [inaudible] standard. Replicating that but on a small scale with the cooperatives, in a sense that you have farmers who bring produce to the market but the question is how it is produced. For example in Merigi Ward, if you talk about crops you have potato as the main crop, you also have maize, beans, cabbages. Then dairy is also there. But what you will find is Merigi Ward has really, really steep slopes, some of those slopes are not ideal for arable farming for crops like potatoes unless you have put in really robust soil conservation measures. So, our thinking was if the cooperatives can be able to give a good promise for income for a farmer because they provide a market, that is, the cooperative can support them to market and the farmer relies on the cooperative to be able to market his crop. Then the cooperative can also set some standards to be met when producing that commodity that is in line with conservation of the farms.

When SNV first came into the community, cooperative membership was low and remained a challenge when I visited Merigi Ward. Indeed, one study participant mentioned that the cooperative had become defunct and had recently been revived: "We are an upcoming cooperative because we just started. [A] long time ago, it was there before and it collapsed. And then some few years ago, it came [back]. So we are trying to revive [it] this time. But it is useful. If members of our village here come together and trust in the cooperative, then we shall go on nicely." SNV knew that to build membership, the cooperative had to offer value to its farmers, and in the case of MFC the value they offered was providing a market for farmers to sell their milk. Thus, SNV focused on building capacity among cooperative leaders through training sessions that pertained to business management and facilitated meetings between cooperative leadership and buyers (companies that process milk). Through these meetings, cooperative leaders were able to interact with business experts learning from them and asking questions. They were also able to create business contacts and links. SNV helped build linking capital between MFC leadership and potential buyers.

SNV also provided “business to business” linkages for the community as a whole through what they called market events. Market events entail inviting farmers from around the basin to meet with suppliers that provide materials and inputs to farmers and government entities that provide farming services (such as soil testing). Businesses that were interested in sourcing and buying agricultural products from the farms in the basin were also invited to engage with the farmers. These market events are set up like an exhibition where farmers could walk around and engage with each company one on one.

One of these market events, referred to as “the exhibition” by my study participants, occurred a few months before I arrived in Merigi Ward to conduct interviews. It was evident among my interviewees that the event had made a strong impression on them. Of the study participants, 18 farmers discussed their attendance at the market event. One farmer stated that he was involved with

organizing transportation for the market event through MFC and so was unable to attend. All of those who took part in the market event talked about it in a positive light. Both bridging and linking capital was facilitated through this event as farmers discussed how they got to interact with the businesses or experts at the event (linking capital) and how they met farmers from other areas (bridging capital) with the possibility of forming business or personal connections. One farmer expressed her liking of the exhibition:

> ***Passage translated by Key Informant***
> She is saying the exhibition was very nice because so many people from this place attended and we came back talking positively of the good things we saw and from interaction from other farmers from other areas. She is saying she liked it; she liked it.

SNV has also conducted field schools or demonstration events within Merigi Ward. On one occasion, I observed MFC leaders and other volunteers busy harvesting potatoes from a demonstration SNV had done.

MFC members were not the only farmers to attend these events. Every event was open to any interested farmer in the community. SNV mentioned that another objective of the market event was to give the cooperatives the opportunity to invite farmers that were not yet cooperative members and get more people interested in joining. Thus, the benefit of this group is not solely to cooperative members alone but all the farmers in the community are able to benefit. One of the cooperative leaders explained:

> So we encourage the community members to adopt [SWC practices] so that they can benefit. So we pass all this information. Even during that exhibition, I move[d] around informing [people] "Let's go" even to those non-members because we cannot leave [them] because they are non-members—they will not benefit, no. We want everybody possible to join the cooperative to implement soil and water conservation, for better yield, for better soil fertility.

While groups play a significant role in the community, the SNV project coordinator revealed that once an organization is formed there is a lack of continual interaction among one another stating: “So many of those organizations were set up with good intentions, but they lack constant engagement

with their members so such that the influence they have on what the members do is really limited." This sentiment was echoed by a few of the farmers. When asked about which group or groups held the most importance to them, five farmers stated that the cooperative was larger, stronger and more established than their other groups. It was clear that not every group in the community was always active or continually engaged. Indeed, MFC itself was at the beginning of its own revival. MFC, as an organization, had previously collapsed and was recently revived by farmers in the community.

To conclude, MFC acts as a link between the community and SNV and its experts. And now, through improved capacity, MFC is a link to potential business partners and government agencies such as agricultural extension officers. As a result of these connections, bridging and linking capital is enhanced for farmers in Merigi Ward through the cooperative. This link provides farmers with access to much needed implementation assistance, information, and expertise. Essentially, the farmers' cooperative facilitates interactions between community members, environmental experts, and the market. Theme 3 and Theme 4 discuss how the MaMaSe initiative, facilitated through MFC, has improved information and implementation assistance.

Summary

Groups play an important role within Merigi Ward providing a system of support to help individuals cope with a variety of issues including financial constraints, personal well-being, access to information, poverty alleviation, and transportation to name a few. In terms of agriculture and soil and water conservation, the Merigi Farmer's Cooperative (MFC) supports the farmers within the Ward providing them with information and implementation support. The government recognizes the importance of groups and uses them to disseminate information throughout the community. Agricultural extension provides MFC with information to disseminate through their network. With its services strengthened by the MaMaSe initiative through workshops and other activities, MFC provides its farmers with vital linkages to environmental experts and business opportunities. These ties help

farmers sustainably improve their farms leading to advancements in economic well-being and environmental conservation.

Theme 3 - Information

Access to context specific information leads to improved understanding of SWC practices. Additionally, providing information that links SWC practices to improving economic well-being adds incentive to farmers to implement practices. By introducing environmental experts and consultants to Merigi Ward through MFC, the MaMaSe initiative has provided the community with access to context specific information about SWC practices.

During the interviews, farmers were asked to describe any known government laws or guidelines related to soil erosion. Twenty-one farmers could state one or more laws. The laws as cited by the farmers include:

- Do not cultivate or plow along riparian areas.
- Do not plant eucalyptus trees in riparian areas.
- Do not farm in steep areas without applying contours to the farm.
- Place soil and water conservation measures along the contours of your farm.
- The farm must have 10% tree cover.
- Avoid overgrazing close to riparian areas.
- There are specific dimensions designated by the government for the creation of footpaths to reduce erosion (narrow footpaths increase erosion).
- One must dig along the contours.
- Culverts are constructed on roads to manage stormwater runoff. If stormwater is diverted away from the road towards a farm, the farmer is prohibited from clogging the culvert. The excess water from the culvert must be managed by the farmer.

It was clear that most of the farmers who participated in this study were aware that there are policies from the government pertaining to erosion and soil conservation. Four farmers went on to say the policy has been established but implementation is lacking. One farmer explained that enforcement has deteriorated through the years:

> **Interviewee:** The county government has not fully implemented those rules, those laws. If they implement those laws, there should be nobody plowing riparian lands. I think they are very relaxed. There is law but to implement it, is a problem. I like the past – the 80s or 70s, you could not plow along the riparian area. You could not plow on the farm without the terraces—making terraces on your farm. And there was somebody from agriculture [extension] moving from area to area.
> **Elizabeth Musoke:** So, there was better implementation then?
> **Key Informant:** Yeah, then.

The government laws recited by the farmers are general and are not context specific to their individual farms. Three farmers stated that they found national guidelines less detailed compared to the information provided through the MaMaSe initiative. One of my interviewees revealed that he attended an agricultural show in Kenya's capital city, Nairobi, but found the information provided to be "shallow" – that is, lacking depth. My key informant added to the conversation stating that the information from the MaMaSe initiative was more tailored to each farm:

> **Interviewee:** When we went to [the] Nairobi international show, I can compare that it was somehow shallow. But MaMaSe is giving us almost more information [laughs].
> **Key Informant:** Because possibly [MaMaSe] come[s] to your farm, so whatever they are telling you is more related to the topography of the farm.

SNV's project coordinator concurred with this observation stating that the biggest problem with large training sessions or shows is that the farmer is unable to take the information and translate it directly to his or her farm:

> Because previously what used to happen was organizations that promote conservation would hold a public training. But you see soil and water conservation, some of the measures are so specific to the farm depending on the nature of the farm that it was difficult for a farmer to leave a crowd training and go and translate that in his own farm.

While farmers have some interaction with agricultural extension staff, SNV has designed an initiative to get the information to the farmers more frequently and provide information that is tailored to the needs of the farmer and the topography of the farm. Because SNV did not have the capacity to train all the farmers within the ward, SNV staff asked each of the cooperatives in the basin to volunteer two farmers that would be trained as service providers. First, the service providers were trained to understand and measure slope percentage. They then use a table to determine the appropriate soil erosion control measures to implement on a specific farm. Armed with a manual, line level, and measuring tape the service providers visit individual farmers, take measurements and advise on the type and placement of the erosion control measures. In addition to providing information, service providers were trained to gather information so that MFC can keep a more detailed log of their members. Before SNV arrived the cooperative only had the names of its members, so they encouraged their trained service providers to "profile" their farmers. The SNV project coordinator explains:

> So because the cooperative had a register of its farmers but the only information they had was the name of the farmer and maybe their id number and nothing more than that. So you see that sort of information is not really useful—it does not inform of production, it does not inform of what the farmer may need or the potential of the farmer.

Each farmer who had interacted with SNV and participated in MaMaSe initiative events was asked to discuss what they had learned in as much detail as possible. The most mentioned erosion control strategies farmers learned from the MaMaSe initiative include the use of sweet potatoes as a cover crop, intercropping sweet potatoes and bananas as an erosion reduction strategy, the use of terraces and trenches, and the use of grass strips to control erosion. These SWC practices will be discussed in more detail in Theme 5. Evidence of these practices was observed through the farm tours. In the case of my key informant, the MaMaSe initiative provided him with new information that he was previously unaware of – calculating slope percentage and erosion:

> **Interviewee:** With our experience with MaMaSe, they also gave more information on percentage slope. Yeah, they were telling us anything that is now beyond 55%... Any

slope that is 55% and above should not be good for farming. Farming practices should not be carried out on such slopes.
Elizabeth Musoke: So that was from MaMaSe, not really the government?
Interviewee: It's from MaMaSe [laughs]. In fact, before, I had not heard about percentage slope and what have you. It's actually from MaMaSe. Somebody attached to MaMaSe, an expert on soil—
Elizabeth Musoke: So that came from there.
Interviewee: From MaMaSe.

One of the most frequently mentioned pieces of information was the connection between napier grass as an erosion control method and a source of fodder. Nine farmers stated they used napier grass as a source of fodder for their livestock to help increase milk productivity. During the farm tours, I observed that most farmers in the study had, at least partially, implemented napier grass as one of their erosion control strategies. One farmer, however, was in the process of relocating his farm. Erosion had severely depleted his farm's soil fertility, so he was forced to move his cultivation area to a more fertile portion of his land. He stressed that he was going to start using napier on his new farm. Below are two quotes from farmers speaking about the dual benefits of using napier grass:

Passage Translated by Key Informant:
And she is also stressing the availability of napier in the production of milk, for the sustainability of milk production... She feels those are the areas she actually got help from MaMaSe.

Even the napier that we grow, we shall always be assured of the availability of that napier to our animals even during [the] dry season. Because the napier would actually trap the fertile soil... When it is cut it regenerates very quickly. So we shall be assured of the availability of cattle fodder.

One of the main goals of the MaMaSe initiative is promoting economic well-being among farmers. The initiative links environmental conservation with potential economic benefits to improve household wealth. SNV's role in the MaMaSe initiative was to provide technical assistance and market-driven solutions to spur development in agriculture. Since MaMaSe initiative partner, the World Wildlife Fund (WWF) Kenya, has had extensive experience implementing and promoting conservation initiatives in the basin, their expertise was used to determine what conservation programs best fit within the upper Mara River Basin. When discussing the different roles of the partners within the MaMaSe

initiative, WWF Kenya project coordinator stated: “For instance, SNV is good at market linkages while WWF is more towards conservation work. So basically, while WWF is concentrating on conservation the SNV team can link up farmers to market opportunities where they can also sell this produce and get some income. At the end of the day [it is] to improve their livelihood other than [just] doing conservation.”

SNV and its experts had a continual presence within the ward. They did not just come into the community once or twice to impart information and leave. They have had a recurring role within the community. This frequent interaction was evidenced by the fact that all the study participants had heard of the MaMaSe initiative and only three participants had not had direct interaction with its activities. When talking to the WWF Kenya project coordinator, he stated that one of the constraints to SWC practice adoption could be the lack of continued implementation support to farmers:

> Conservation agriculture has been there for some time, but there is no one to basically follow up with the farmers and make them understand how this entire process works and even give them one on one support.

The service providers trained by SNV can fill this need and provide support. WWF Kenya has a similar approach to SNV’s service provider model. WWF Kenya’s project coordinator explained that each village forms a committee of farmers and this committee follows up with other farmers on ongoing WWF Kenya initiatives. This approach, however, is not directly connected to the MaMaSe initiative. WWF Kenya has also been working in conjunction with the Ministry of Agriculture, through their own initiatives, to enhance extension services.

Context specific information and repeated interaction with SNV has allowed the farmers to retain information and develop a greater understanding of how to use SWC practices on their farms. With SNV spearheading the MaMaSe initiative among farmers and WWF Kenya working through its own efforts while supporting the MaMaSe initiative, these two organizations support and enhance a vital government function – agricultural extension. My key informant stated:

> Yeah, we feel [MaMaSe] is complimenting efforts from the government. Though the way we see the government at times, it's as if it is a big family that has to attend to so many children. But when an organization like MaMaSe comes and identifies a particular area and works with that community you find… The results are quick. It takes a short time for results to be realized. Yeah. Because they normally come, they monitor. They continue talking and interacting with that community, unlike the national government which may lack extension staff or that the area is... the expansiveness of the area.

Summary

During the interviews, farmers were asked to recite any government guidelines or laws they knew about soil and water conservation practices. Most farmers were able to recount some laws, but most of the laws stated were very general. The MaMaSe initiative has provided context specific information related to SWC practice implementation. With this information, farmers were better able to understand and implement SWC practices on their farms. When asked about what they had learned from the MaMaSe initiative, the farmers were not only able to describe specific practices, they also understood why it was necessary and the benefits of implementing SWC practices. In particular, nine farmers mentioned the dual benefit of planting napier grass as an SWC practice and a source of fodder for their livestock to improve milk production. To ensure the dissemination of context specific information, SNV developed a service provider model where two farmers from MFC were trained to help farmers in the community understand the importance of soil conservation. The two trained service providers also advised each farmer on the most appropriate SWC practice(s) to implement. WWF Kenya also uses a similar approach to the service provider model. SNV also held several community-wide group training events and demonstrations to help disseminate context specific information. The MaMaSe initiative's continual presence in the community has helped farmers gain a better understanding of soil and water conservation.

Theme 4 – Community Learning

Strong bonding capital, fostered through high levels of trust and the formation of groups in the community has enabled a collaborative environment where information from the MaMaSe initiative is disseminated by the farmers themselves.

SNV's strategy of training service providers has empowered farmers within the cooperative to conduct peer-to-peer learning to encourage adoption. The SNV project coordinator states that the service provider program is one of the successes of the MaMaSe initiative when it comes to working with farmers:

> One of the successes I would say is the service provision system. Because previously the cooperative did not have a mechanism for interacting with its members and being in constant touch and understanding what is happening on the farm[s] and the challenges. The service provider system enables them to do that. And with that, we have been able to have a very high number of farmers who are setting up erosion control mechanisms.

MFC leadership have taken it upon themselves to teach erosion control practices within the community. One of the members of the MFC leadership team discussed how he feels he has an obligation to spread information and teach others about SWC practices:

> Like I was saying I am one of the officials of Merigi Farmers' Cooperative Society, so it means it is a volunteer service. Of course, you are not in employment. So I have to. I have to. In fact, [key informant name] can bear witness, we meet, we spend most of our time together discussing issues. Because at the end of the day, you know, you have to look around. If you are well off, maybe [with] ideas, you have a better idea than your neighbors. So you volunteer to go and discuss that issue.

Farmers have come to depend on their peers at MFC. When study participants were asked where they get their information about agriculture, 18 farmers named MFC as their preferred source of information. The next most cited source for getting information was the Ministry of Agriculture – ten farmers mentioned that they went to extension services for information. These counts include the number of farmers who cited both as their preferred sources. It is apparent, however, that most of the farmers interviewed rely on the cooperative for information. At the time of these interviews, Kenya had

devolved several services to the county level rather than providing services from a national platform. My key informant explained that once the agricultural services had been devolved to the county level, the Ministry of Agriculture began to use the cooperatives to disseminate information:

> **Key Informant:** I can say now 90%... Over 90% of the information comes through the cooperative. Because recently when some services were devolved to the county, agricultural [services] were actually devolved to the county level and the Ministry has also identified cooperatives… To work with cooperatives.
> **Elizabeth Musoke:** As an entry point also.
> **Key Informant:** As an entry point also to the community.
> **Elizabeth Musoke:** So they filter their information through the cooperative?
> **Key Informant:** Yeah, the cooperative. Then the cooperative passes information to the members.

The farmers were also asked where they turned to for help when they encounter farm related problems (i.e. crop loss, crop disease). Eleven members stated that they turned to MFC for support. The Ministry of Agriculture was also mentioned as a source of support by ten farmers. A few farmers said that both the Ministry of Agriculture and MFC act as their source of support. One farmer explained that the cooperative was the first point of contact. Depending on the problem the cooperative would either handle the issue or contact experts who can provide assistance.

Five farmers expressed their desire to be role models in the community and model the correct behavior or actions to become better environmental stewards. These farmers implement SWC practices on their land first, then invite neighbors to do the same using their farm as an example. One farmer explained why it is best to implement SWC practices before telling others to get on board:

> Even for someone like myself, I say that I better do it, so that when I am preaching about this, they will be able to perceive [it] positively rather than just going to tell them something that I have not done myself.

WWF Kenya invites farmers who have had success implementing SWC practices to help encourage adoption. Rather than soil professionals telling farmers about the benefits of soil and water conservation, WWF Kenya asks successful farmers to share their experiences so that those yet to adopt SWC practices can learn from their peers:

> And we go with some of the farmers to those best-performing farms; they are able to pick out and learn from those farms and are able to implement this in the specific area. And ideally, when these best performing farmers narrate their stories that their yield has improved, it also encourages others to adopt conservation agriculture so that they can also enjoy the benefit of improved yield.

Twenty-four participants stated that they share the information they have learned from the MaMaSe initiative and MFC with others in the community including their neighbors, families, and others in their network. The one farmer who did not actively share or exchange information with his neighbors stated that most of the information he received was learned in a group setting with other farmers. Thus, he did not take it upon himself to share information when most of his neighbors attended the same training: "All [of] us, we have the information. So particularly for me, I have not done that, individually. When they visit us, they come to our group, and then we learn together."

The quote below provides an example of how one farmer shares information with his family and others. He visits his parents and helps them and others nearby by introducing farming techniques:

> Sometimes I go and assist [my] parents on the other side. My parents are not far from here. They are nearby here, so sometimes I go there and also introduce a way of farming in that area. So they also benefit from me.

During the interviews, a few farmers narrated experiences where turning to a neighbor to learn was beneficial. In one case, a female farmer said she observed how her neighbor dug a trench with the intention of slowing runoff and reducing erosion. Through her observations, she was able to replicate the same practice on her farm. One farmer also discussed the importance of teaching others and sharing information with the understanding that if his neighbor does not implement practices, his own farm will be affected and vice versa. He explains that because natural resources within the community are shared, it is important for everyone to commit to soil and water conservation because everyone in the community will be affected: “We share with our neighbors. If I leave this water to pass that way, the other field will be affected. The person will be affected. So, we share.”

While conversations can help community members be informed about SWC practices, it does not guarantee adoption. One study participant mentioned that he was still struggling with runoff because an adjacent neighbor had not implemented any SWC practices. I was able to see his neighbor's farm during the farm tour; the farm did not have any noticeable SWC practices present (Figure 4.6).

Figure 4.6 Neighboring farm with no prominent SWC practices (Source: Photo by Author)

Another study participant admitted that though he discussed SWC practices with his neighbor, he did not put in erosion controls at first:

> ***Passage translated by Key Informant:***
> He is pointing to the farm that we have come from; he used to discuss with the owner of the farm [about] planting napier. Except he forgot to implement on his farm.

It was only after seeing the negative effects of erosion that he decided to implement SWC practices.

Summary

Ultimately, farmers are becoming more informed through organizations like SNV and WWF Kenya but also from one other. In terms of the MaMaSe initiative's role, community learning has been enhanced by the service provider model, empowering members from MFC to become teachers in the community through peer-to-peer learning. WWF Kenya has also encouraged peer-to-peer learning by emboldening those successful in implementing SWC practices to share their personal experiences with others. Farmers who have seen the benefits of SWC practices have also become advocates for environmental conservation and use their own connections and relationships within the community to share information and their own experiences. Essentially, the farmers are learning SWC practices from one another or in the least becoming more informed of what can be done to reduce erosion.

Theme 5 – Positive outlook

Selman (2001) and Flora et al. (2016) agree that a shared vision is an important part of social capital and community collaboration and initiative. By witnessing the benefits of SWC practices, the farmers have a shared positive outlook for the future.

While walking through the community, my key informant pointed out farms that had experienced landslides. It was clear from conversations with the farmers that this area had experienced the damaging effects of erosion. To assess farmer perception of erosion, each farmer was asked to describe the soil erosion problems they had encountered and whether they felt erosion was a major concern. All 25 farmers expressed that they had experienced erosion on their farms. The farmers recognized that the steep slopes that characterize the region are prone to erosion. Additionally, farmers explained that the heavy rains experienced during the year in this region exacerbate erosion on these steep slopes if they are left unprotected:

> This part of the country is sloping. You know the [inaudible] of Bomet County is generally hilly, sloping. So, because of the nature of the land, there is a lot of soil erosion

> in this area. So, you find, especially when the soil is fine after plowing... After heavy rains, you find the top fertile soil is normally carried down the river.
>
> Of course, I have experienced [erosion] because of the nature of the land. That is the topography.

During heavy rainfall events, farmers who live on very steep slopes have had their crops literally swept downstream by runoff:

> Some time back we had a very serious problem with erosion because whenever we planted our plants... Very soon the rains come and swept them out, down there.
>
> Another problem after planting, so when heavy rains are experienced in this area planted crops are normally destroyed by the water as [it] run[s] down.
>
> **Passage translated by key informant:**
> She is recalling a time when she planted that farm, and there was rain. The rain swept everything in the farm including the maize. That is why she got angry and started putting in [SWC practices].

According to the SNV project coordinator, while cultivated land contributes to erosion in Merigi Ward, one of the other main sources of erosion are the footpaths. The footpaths are shared by farmers in the community and are used to transport their cattle and other livestock downstream. As I walked with my key informant around the community, he pointed out that the footpaths were compacted and gullied (Figure 4.7). Two farmers discussed footpaths recognizing that they are major contributors to erosion. One of these farmers explained that repeated transportation of cattle had caused problems:

> **Interviewee:** But there is a major problem we encounter... Footpaths.
> **Elizabeth Musoke:** Oh, the footpaths.
> **Interviewee:** [Inaudible] It is very hard [and] difficult to control [erosion]. Because every now and then, morning, evening... You take the cattle up and down, up and down.
> **Elizabeth Musoke:** So that is also another area that-
> **Interviewee:** That is another area. That is another area.

Figure 4.7 My key informant walking ahead of me on a footpath that had been eroded (Source: Photo by Author)

Farmers whose land is adjacent to roadways, buildings or stormwater management structures (i.e. culverts) discussed how runoff from those surfaces has also affected their farms. While the roads within Merigi are made of dirt, they have been compacted by vehicular travel, and thus water collects and flows directly onto farms:

> I neighbor with a road, and the runoff from the road actually enters the farm. The washing away of soil is more or less severe where surface runoff from the [road] enters the farm.
>
> Maybe the Ministry constructs a culvert near your farm. The rain might come to your farm and destroy the crops again. Those are the issues that we have been facing here.
>
> You find farms around schools— we have got a school up here, Saoset Primary School and Saoset Secondary School – so normally there is a lot of water collected from the roofs of the buildings... So most of this water is not harvested in schools. Because they have perhaps one tank. So the tank gets filled within a very short time after heavy rains. The rest of the water flows downwards and destroys the farms of farmers around the school.

With farming being the main source of income for all the study participants, erosion was very concerning and a problem that needed to be addressed. For one farmer, whose land mostly lay on gentler slopes, erosion was not a major concern but he mentioned that he still had to use SWC practices in some areas of his farm. The most mentioned problems include low soil fertility leading to lower crop yields and sedimentation of streams leading to a decrease in water quality and quantity. The quotes below are from farmers expressing the problems related to erosion:

> ***Passage translated by Key Informant:***
> He is saying [erosion] is a concern to him because he used to grow crops there and the soil is eroded and he saw the soil was becoming infertile... So it was actually troubling him.
>
> The critical part of it is washing [away of] the topsoil, that is the fertile soil of course. That is the crucial part of it. And of course, it is making gullies.
>
> One of the problems, if you don't do anything on your land about soil erosion... [The] soil will be taken by [the] water downward and your land will be useless.
>
> Yeah, [the] washing away of soil. And maybe depositing in our springs, dirtying our drinking water.

All 25 farmers stated that erosion was a concern and worrying enough that SWC practices were needed to reduce its effects.

The most discussed SWC practice was the planting of napier grass (Pennisetum purpureum). Twenty farmers mentioned they had planted napier grass in the form of vegetative or grass strips

(Figure 4.8). Napier grass, also known as elephant grass, is a perennial plant that is native to subtropical Africa (FAO, n.d. – b). Napier grass' natural habitat is damp grassland and forest edges but it has a deep root system that allows it to survive in times of drought and is also well suited for erosion control (FAO, n.d.-b). Napier grass was also used as fodder for livestock which helped improve milk production which is consistent with findings in Orodho (2006) who states that napier grass is an important source of animal fodder among smallholder farmers in Kenya. Vegetative strips can be used as the sole erosion control technique although they are often used in combination with other SWC practices.

Figure 4.8 Napier grass strip (center of image) planted between maize and bare land (Source: Photo by Author)

On steep slopes, vegetative strips can be placed 10m – 15m apart (Liniger, Studer, Hauert, & Gurtner, 2011). On gently sloping land vegetative strips are 20m – 30m apart (Liniger et al., 2011). The strips can be anywhere from half a meter to a meter wide (Mati, 2005). Other grasses mentioned by the study participants include Kikuyu grass (Pennisetum clandestinum) and the Boma variety of Rhodes Grass (Chloris gayana). The farmers referred to the latter as Boma Rhodes grass.

Fourteen farmers stated that they had introduced terracing or dug trenches to slow runoff on their farmers. The most popular terrace used among the farmers is the fanya chini terrace (Figure 4.10). The literal translation of fanya chini is "do downwards." The phrase "do downwards" refers to the soil that is pushed downslope forming an embankment after a trench or channel is dug along the contour line (Figure 4.9) of a slope.

Figure 4.9 Farmer standing next to the beginning of a fanya chini terrace. A trench has been dug. (Source: Photo by Author)

Figure 4.10 A complete fanya chini terrace. The trench is dug, and the soil has been pushed downslope. Trees and grass have been planted in and around the terrace to reinforce the loose soil. (Source: Photo by Author)

A small ledge is left between the channel and the embankment so that the soil does not slide back into the channel (Liniger et al., 2011). These terraces can naturally form bench terraces over time due to soil movement (Liniger et al., 2011; Sustainet EA, 2010b).

Other SWC practices include the use of cover crops. Farmers mostly used tea and sweet potatoes as their cover crops. Cover crops provide several benefits by helping:

- Reduce the amount of bare soil thus decreasing erosion.
- Create ideal conditions for soil fauna which provide benefits to the soil.
- Reduce the growth of weeds.

- Reduce the evaporation of water from soil thus conserving moisture

(Sustainet EA, 2010a).

Another technique that was frequently seen was the intercropping of sweet potatoes and bananas (Figure 4.11). A series of holes are dug, with each hole measuring approximately 1.5 feet deep and two feet wide. A banana tree is planted in the center of each hole. Sweet potatoes are then planted around each hole and in between the holes. The line of banana trees slow runoff and retains fertile topsoil, while the sweet potatoes planted between the banana trees also help slow runoff and act as a cover crop.

Figure 4.11 Intercropping of banana trees and sweet potatoes (Source: Photo by Author)

The implementation of SWC practices brought not only a reduction in erosion, observed by the farmers but a positive outlook for their financial future and livelihoods. The WWF Kenya project coordinator stated that they had observed the benefits of SWC practices in two ways: (1) soil monitoring lots on a few farms have shown reduced erosion and (2) farmers have reported increased yield of maize and beans. Seeing the benefits of SWC practices has translated to a positive outlook towards environmental conservation amongst the study participants. The quotes below demonstrate this positive outlook:

> And again I think, one closest person who has seen the benefit is my mother. Because, especially in her farm, she also used to harvest something very little. But now, even this year, she has gotten something good in her farm. She told me the other time... She is seeing something good in her farm.
> **Passage translated by key informant**
> The planting of napier grass prevented the soil from being carried away— she is seeing the benefits of the farm, increasing the income of the household.

During the interviews, the farmers were asked broadly to describe what future they envisioned for their farms with additional prompts related to the tenure of the farm and whether they share their erosion control plans with other farmers. In addition, the farmers were asked whether the MaMaSe initiative had influenced their future plans. In the interviews, all the farmers expressed that soil conservation is an important component of their future. Of the farmers who interacted with the MaMaSe initiative (n=22), the initiative played an important role in teaching them the need for conservation to improve their wellbeing. One farmer stated:

> So, with MaMaSe… I have benefited from MaMaSe. I have now [an] idea [of how] to increase production on my farm. Because I don't want to lose soil... Milk production, has also gone up because when I strip napier grass, I get extra fodder for my animal. So if it is more milk, more money. More production on [the] farm, more money, and more food.

In another instance one farmer stated that she wants to conserve the environment for future generations:

> ***Passage translated by Key Informant:***
> She is now convinced without conservation the future generation will not have food, will not even have milk, unless they do something now [with] conservation. So she is convinced that the first thing is conservation and then other things can follow after conservation.

Another farmer describes his future outlook in terms of maximizing production without the need for more land:

> I think our farms will even be better in future when all these soil conservation measures have been put in place. So far, we expect produce from our farms to be a bit better, in the near future, when all the soil control measures have been put in place and new farming technologies have been introduced. So, I expect to get better… Better yields from our farms - say better yields from smaller area. Maximum outputs.

With a more secure future, eleven farmers stated that they were interested in diversifying activities on their farm to produce new products or integrate new strategies. Among these farmers, the new activities to be pursued in the future include: bee-keeping, improving dairy production, integrating agroforestry into current farm practices, planting new crops and grass for fodder, poultry keeping and integrating zero-grazing practices.

While farmers have a positive environmental outlook and are actively learning from one another and sharing information, fourteen of the farmers stated they were not actively planning and coordinating the implementation of future SWC practices with their neighbors. Of those who said they were sharing future plans, it was mostly in the form of encouraging other farmers to implement practices and take environmental conservation into account, rather than coordinating and planning to work together to implement SWC practices in the future. So even though community collaboration occurs when there is a communal problem or when an individual asks for assistance, future planning for erosion control as a collaborative effort is not a priority among the farmers interviewed. The ability to collaborate across farms on widespread SWC practice implementation remains a challenge. The SNV project coordinator explains that because of the land holding system which is freehold, every household is essentially independent and there isn't a push to work collectively in terms of erosion control:

> It is more or less [that] every household is independent and individual on its own. So that is a bit of a challenge. And what a farmer does on his farm is difficult to control because the land holding system is freehold meaning "I have the right to do whatever I want on my farm." So it is an issue of convincing somebody to do what they need to do on their own farms. Lands are not communal. So that also brings in a challenge in terms of community participation in soil and water conservation. And you see the basic unit where soil and water conservation is to happen is at the farm level… Because collectively the impact of poor soil and water conservation practices in every farm add up to the challenge that you face in the basin. But now it means you have to find a mechanism for convincing each and every farmer.

Summary

All the farmers expressed that they had witnessed the effects of erosion on their farms. It was clear that all of the farmers understood what erosion was and the factors that contributed to erosion on their farms. Loss of soil fertility leading to lower crop yields was the most cited problem associated with erosion. With this understanding, farmers were also able to recognize the benefits of SWC practices and the importance of sustainable land management. To combat erosion, farmers had implemented a variety of practices including fanya chini terraces, grass strips, intercropping techniques and cover crops. When asked about the future, most farmers shared the understanding that environmental conservation is important for the well-being of their families and future generations. Having this shared positive outlook towards environmental conservation and SWC practices amongst farmers can help with the proliferation of SWC practices within the community. While the farmers interviewed agree environmental conservation is important, most farmers were not actively working with their neighbors to implement SWC practices collaboratively. Essentially, most farmers were focused on improvements on their own farms without working collectively to have a greater impact at the community level.

The next and final chapter will discuss the final themes in relation to the research questions. Specifically, the themes will be discussed in relation to the four dimensions of social capital defined for this study: groups and networks, information, trust and reciprocity, and informal and formal rules. Additionally, I will describe how the findings of this research relate to previous SWC adoption studies.

The results will also be used to provide implications for natural resource managers working in soil and water conservation. Recommendations for future research and policy will also be described. Issues of generalizability and critical reflexivity will also be discussed in the following chapter.

Chapter 5 - Discussion

Introduction

Nobel laureate and Kenyan environmentalist, Wangari Maathai, once said (as cited in Dalby, 2011, p. 62): “You cannot protect the environment unless you empower people, you inform them, and you help them understand that these resources are their own, that they must protect them.” This quote represents the findings of this dissertation. Onyx & Bullen (2000) describe social capital as “people power” which can be harnessed by anyone regardless of their position in society. The farmers I interviewed in Merigi Ward had become empowered through the use of social capital and were better able to make decisions about SWC practices and environmental conservation.

This final chapter restates the study objectives of the dissertation and summarizes the methods and research questions. The two research questions are answered by describing the final themes in relation to the four dimensions of social capital defined for this study. Comparisons of the findings to the literature are also described. Finally, critical reflexivity, generalizability, and implications for research, practice, and policy are discussed.

Study Objectives

Several scholars have suggested that social capital does influence the adoption of soil and water conservation (SWC) practices (Kassie et al., 2015; Njuki et al., 2008; Nyangena, 2008; Teshome et al., 2016a; Teshome et al., 2016b; Wossen et al., 2015). The question now becomes how can social capital influence the adoption of these practices.

The first objective of this dissertation research was to better understand how social capital works in the context of a community and be utilized to improve natural resource management. The second objective sought to investigate how a public-private partnership working to enhance sustainable development could strengthen social capital in the same community. To explore these two research

objectives, the study was conducted in the farming community of Merigi Ward, Kenya. Merigi Ward is located in the upper Mara River Basin where the predominant land use is small-scale agriculture. The smallholder farmers residing in the ward have experienced extensive erosion problems which adversely affected their livelihoods.

Research Questions & Methods

The purpose of this dissertation research drove the formation of the research questions. We must understand how social capital operates in a community to find avenues to build and increase its effectiveness. Two research questions were posed to gain a better understanding of social capital and the adoption of SWC practices:

(1) How does social capital influence the adoption of soil and water conservation practices among smallholder farmers within Merigi Ward, Kenya?

(2) How does the MaMaSe initiative influence the level of social capital among smallholder farmers within Merigi Ward, Kenya?

A qualitative case study approach was chosen to explore the research questions as qualitative methods have the ability to better understand context and processes (Dudwick et al., 2006). Semi-structured, in-depth interviews were conducted with 25 smallholder farmers who were adopters of SWC practices. The transcripts of these interviews were analyzed using initial and pattern coding. A staff member from both SNV Netherlands Development Organization (SNV) and World Wildlife Fund (WWF) Kenya was also interviewed. Their transcripts were not analyzed but used as supplementary data to support the findings of the coding analysis.

Summary of Findings

To address the two research questions, social capital was defined using four dimensions. These dimensions were mostly derived from the work of the World Bank (see Dudwick et al., 2006); Webb & Cary (2005) and, lastly, Nyangena's (2008) study that explored social capital and SWC practice adoption in Kenya. The four social capital dimensions are as follows: (1) groups and networks, (2) trust and reciprocity, (3) formal and informal rules and (4) information. Chapter 3 provides a description of each dimension. The following section answers the research questions by discussing how each social capital dimension influences the adoption of SWC practices. To answer the second research question, I describe how the MaMaSe initiative affected each dimension of social capital. Lastly, the overall impact of the MaMaSe initiative on the farmers is discussed.

Trust and Reciprocity

Reciprocity refers to the exchange of goods and knowledge. Reciprocity is also said to foster trust (Pretty, 2003). Theme 1, strength of community bonds, suggests there are high levels of trust and reciprocity in Merigi Ward. The high levels of trust and reciprocity have fostered strong bonding capital amongst farmers and encouraged collaboration. Farmers are actively sharing goods and knowledge related to SWC practices between one another. Additionally, the farmers also volunteer their time to help one another with farming and erosion related problems. In other instances, farmers have donated their grass seeds (from grasses used for erosion control) so that others can plant grass strips and reduce erosion. These findings provide an example of what Nyangena (2008) and Tehsome et al., (2016b) suggest in their studies. Nyangena (2008) and Teshome et al., (2016b) both suggest high levels of trust facilitate community interaction and collaboration which is important when community members turn to one other to implement SWC practices. Nyangena (2008) states that with high of levels of trust

community members rely on each other and share risks, while coordination at the community level is improved.

It was not particularly apparent how the MaMaSe initiative affected the level of trust amongst the farmers. The P3, however, helped the Merigi Farmers' Cooperative (MFC) build trust between itself and the community. MFC had been established before but had broken down. When I arrived in Merigi Ward the farmer's cooperative had just been recently reformed. The MaMaSe initiative strengthened MFC by providing training on how to successfully run a farmers' cooperative, educating the leadership and providing capital to help the cooperative conduct some of its essential duties. These efforts will certainly go a long way in helping MFC re-establish itself in the community and establish trust with its members and those looking to join. Regarding reciprocity, the MaMaSe initiative provided opportunities for farmers to exchange knowledge with other farmers from around the basin through its market events. In the interviews, farmers said they had a chance to exchange experiences and ideas with farmers outside of Merigi Ward.

Information

The World Bank states, "Increasing access to information is increasingly recognized as a central mechanism for helping poor communities strengthen their voice in matters that affect their well-being" (Dudwick et al., 2006, p. 21). Access to information is an important part of implementing SWC practices. Without information, the adoption of SWC practices cannot occur (Knowler & Bradshaw, 2007). Theme 3 (Information), however, argues that mere access to information on SWC practices is not enough. The type of information and how it is delivered plays an important role. Most of the African SWC practice adoption studies that address social capital have not addressed the type of information nor how it is delivered. Nyangena's (2008) study looks at information as a dimension of social capital but only regarding the availability of information to farmers. Other scholars have looked at the education level of

a farmer as an indicator of their ability to implement the information they receive (see Teshome et al., 2016b). Kassie et al., (2015), Njuki et al., (2008) and Wossen et al., (2015) discuss information in terms of access/or the flow of information through networks. While these scholars provide important insights, the findings of my dissertation suggest context specific information tailored to the farmer's land is key to improving the adoption of SWC practices.

The peer service provider model developed by MaMaSe initiative partner, SNV, was also an important part of improving the adoption of practices as it was used as a delivery mechanism to disseminate context-specific information. The service provider model is described below and at length in Theme 4 (Community Learning) in Chapter 4. The service provider model does not place a strain on the existing services of local extension providers and helps farmers receive frequent context specific information and support.

In addition to developing the model, when SNV provided information they linked the importance of SWC practices with improved economic productivity, which allowed the farmers to understand environmental conservation is essential to their well-being.

The data suggests that groups and networks and information are interconnected. The discussion below demonstrates the role groups and networks play in information dissemination as well as other benefits.

Groups & Networks

Theme 1 (Strength of Community Bonds), Theme 2 (The Importance and groups) and Theme 4 (Community Learning) demonstrate that groups and networks play an important role when it comes to the adoption of SWC practices. Strong bonding capital has enabled the community to work together and support one another. In particular, support is provided to one another through the formation of groups.

The use of groups has become a way for community members to work together to meet the needs of individual families.

While community-based organizations and groups, promote environmental conservation, the Merigi Farmers' Cooperative (MFC) is the group that plays the largest role in the adoption of SWC practices in Merigi Ward. Being a member of this group allows farmers to have greater support when it comes to implementing SWC practices on their farm. Members of the cooperative have access to the most relevant information, resources, and implementation assistance. These results support findings in previous quantitative studies where memberships to farmer organizations had a positive influence on the adoption of SWC practices (see Abdulai & Huffman (2014); Abdulai et al., (2011); Mwangi et al. (2014); Kassie et al (2013); Nyangena, 2008). Abdulai & Huffman (2014) suggest that farmer organizations provide a social network through which information can flow which encourages the adoption of SWC practices. My study concurs with Abdulai & Huffman (2014) as the majority of farmers stated they received information about SWC practices from the farmers' cooperative. Furthermore, agricultural extension recognizes the power of the cooperative and relies on MFC to disseminate information using its network.

One key finding that hasn't been extensively addressed in African SWC practice adoption studies is peer-to-peer learning. Theme 4 (Community Learning) discusses peer-to-peer learning at length. The MaMaSe initiative partner, SNV, trained a few MFC volunteers to act as peer service providers. These service providers educate their peers on how to implement the most appropriate SWC practices. Essentially, the service provider model helped facilitate the learning and implementation of SWC practices within the community. The model uses the farmers themselves to proliferate information through their already established networks.

The MaMaSe initiative has helped strengthen groups and networks in the community by enhancing social organization and networks. As discussed in Chapter 2, Leahy and Anderson (2010)

introduce social organization and networks as one of the three aspects of social capital. The other two aspects are (1) community resources available for individual use and (2) positive or negative group externalities. Under social organizations and networks, three forms of social capital (bonding, bridging and linking capital) were discussed. In terms of SWC practices, Njuki et al. (2008) discusses that bonding, bridging and linking capital all affect adoption differently and organizations should strengthen these forms of capital by: "supporting local kinship or community groups that generate social capital, promoting farmer access and links with external organizations that can act as sources of information and technologies for farmers, as well as links with other farmer associations and groupings from whom they can learn," ("Conclusions and Recommendations," para 1).

This dissertation provides an example of how an organization, in this case, a public-private partnership, can strengthen the different forms of social capital. The MaMaSe initiative helped strengthen bonding, structural and cognitive capital within MFC by improving the cooperative's services and helping the cooperative gain trust in the community and increase membership. The MaMaSe initiative also helped grow both bridging and linking capital amongst farmers. Market events allowed farmers to interact with other farmers from areas outside of Merigi Ward thus improving bridging capital and structural capital through the expansion of networks. The P3 also improved linking capital by creating business linkages between the farmers and potential buyers and environmental experts.

Formal and Informal Rules

Compared to the other dimensions of social capital explored in this dissertation, formal and informal rules had the least impact. Formalized rules refer to laws implemented by regional or local governments that influence soil conservation practices. Informal rules are defined as local or cultural rules (can be unspoken or assumed) that influence the use of conservation practices in the ward. Farmers were aware that there are laws that govern soil conservation and could describe some of them.

They did not find these laws inhibitive and said they were helpful. The law they knew still helped them understand what should be done but did not tell them how to implement conservation practices. Context-specific information from the MaMaSe initiative helped fill in the gaps government laws have left.

Informal rules related to SWC practices were not apparent in this study. Cultural rules discussed by the participants related more to the role gender plays in the inheritance of farms rather than specific practices conducted on the farm. Njuki et al., (2008) suggest that gendered social capital is an important aspect in understanding the adoption of SWC practices, as women should have access to SWC practices that are less labor intensive but economically beneficial. While gender was not studied in this dissertation, a few female participants stated they turned to their women's groups to reduce the labor intensity of some SWC practices. Specifically targeting and working with women's groups to improve SWC practices could be a way to enhance gendered social capital among female smallholder farmers.

Impact of the MaMaSe initiative

While the overall impact of the MaMaSe initiative is not explored in this dissertation, the impact of the P3 on the lives and environmental practices of the farmers I interviewed was evident. The MaMaSe initiative is a large public-private partnership (P3) with partners from a variety of sectors (see Chapter 1 for a more detailed description of the partners). Due to the variety of organizations, the MaMaSe initiative was able to provide a diverse set of resources to the community that a sole organization would not have been able to do. The MaMaSe initiative provided funding, training sessions, research and information from knowledge institutions, environmental experts, market experts, organizers to coordinate market events and more to the Mara River Basin. The expanded services the MaMaSe initiative provides are in line with notion that partnerships help enhance natural resource

management by providing enhanced services and resources (see Dale and Newman, 2010; Woolcock and Narayan, 2000).

In terms of SWC adoption, the findings of this study agree with scholars who have stated that partnerships can enhance adoption by providing more resources (i.e. information, technical assistance, credit) to a community (see Kassie et al., 2015; Nyanga et al., 2016; Abdulai & Huffman, 2014; Recha et al., 2015). In particular, Abdulai & Huffman (2014) discuss how inputs from other sectors, in particular the private sector, can enhance agricultural extension services. The MaMaSe initiative partner, SNV, was able to play the role of extension by providing information, technical assistance, and linkages to the market. SNV received support from researchers at Wageningen University and local "know-how" from WWF Kenya to effectively implement their programs and activities in the basin. Nyanga et al., (2016) suggests that partnerships could provide enough resources to scale up sustainable land practices – I see the potential of that possibility from my data collection, but the scope of my dissertation does not answer whether the MaMaSe initiative has been able to successfully scale up the adoption of SWC practices within the upper Mara River Basin.

Lastly, Flora et al. (2016) discuss that a shared vision can help enhance community initiative, responsibility and adaptability which are needed to build social capital in a community. Webb & Cary (2005) and Selman (2001) also state the importance of a shared vision. The MaMaSe initiative played a large role in creating the positive outlook (described in Theme 5) that was present in the community at the time of data collection. Among the farmers interviewed, it was apparent that there is a shared understanding that environmental conservation and the use of SWC practices are vital to the wellbeing of their families and their community. This shared perspective had influenced the farmers to use SWC practices and work with one another to mitigate erosion.

Flora et al., (2016) also state communities that possess both high bridging and bonding capital tend to make decisions based on the common good. From my observations, Merigi Ward has strong

bonding capital while bridging capital has been improved through the MaMaSe initiative. With the help of initiative's training sessions, the Merigi Farmer's Cooperative has begun encouraging the farming community to make decisions based upon the common good. More work still needs to be done to help every farmer think in this way as there are still farmers who have not adopted SWC practices. It is my belief that if the shared positive outlook on environmental conservation seen amongst my interviewees can be spread throughout Merigi Ward, then the community as a whole can work collectively across farms to implement widespread SWC practices.

Summary

Three of the social capital dimensions were found to have the most influence on the adoption of SWC practices amongst the smallholder farmers. The three dimensions are groups and networks, trust and reciprocity, and information. Formal and informal rules did not have a major influence on adoption.

High trust amongst the farmers and the community helped foster farmer collaboration and reciprocity which helped the farmers implement SWC practices. This concurs with Teshome et al. (2016b) and Nyangena (2008) who discuss that trust helps foster collaboration and community interaction which aids in the implementation of SWC practices. The next dimension, groups and networks, plays an important role in providing the support farmers need to implement SWC practices. This finding agrees with a variety of scholars who state membership to groups such as farmer's cooperatives and farmer's organizations positively influence the adoption of SWC practices (see Abdulai & Huffman, 2014; Abdulai et al., 2011; Mwangi et al., 2014; Kassie et al., 2013; Nyangena, 2008).

Groups and networks and information were found to be highly connected. Strong networks in Merigi Ward fostered learning, particularly, peer-to-peer learning and the proliferation of information. Additionally, the presence of context specific information also helped the farmers understand what types of SWC practices they needed to implement on their farms. To my knowledge, the influence of

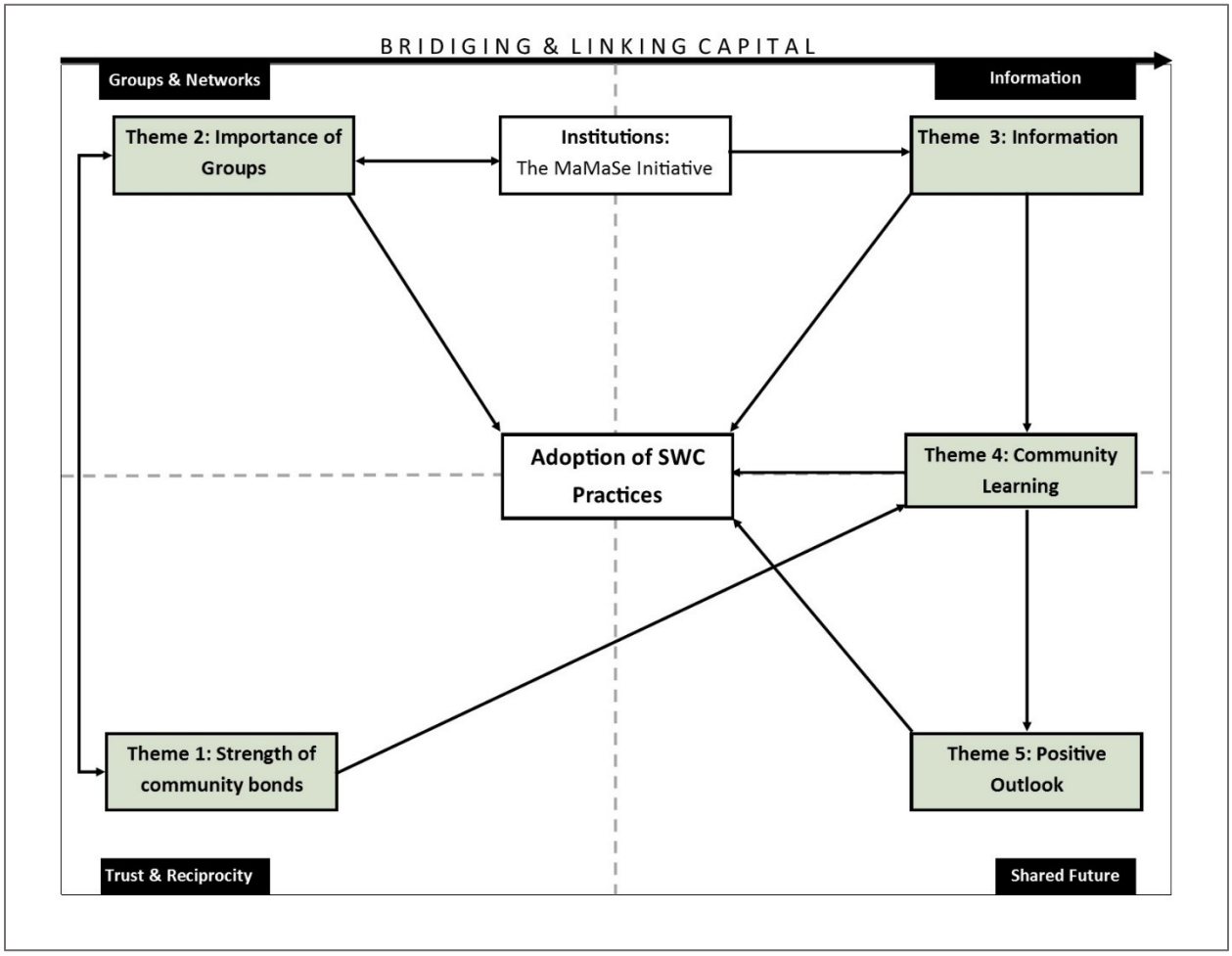
peer-to-peer learning and context specific information on the adoption of SWC practices has not been extensively discussed in the literature.

The MaMaSe initiative had the greatest impact on groups and networks and information. They expanded networks (bridging and linking capital), strengthened the MFC, and provided context specific information. These enhancements led to the improved understanding of soil erosion and SWC practices amongst the smallholder farmers. This finding agrees with the literature that states partnerships provide improved resources and services (Dale and Newman, 2010 and Woolcock and Narayan, 2000) which help enhance the adoption of SWC practices (see Kassie et al., 2015; Nyanga et al., 2016; Abdulai & Huffman, 2014; Recha et al., 2015).

In addition to the dimensions, a shared vision played an important role in Merigi Ward. A shared vision is important when it comes to building social capital in a community (Flora et al., 2016; Webb & Cary, 2005; Selman, 2001). The MaMaSe initiative was responsible for instilling a positive shared outlook amongst the farmers which emphasized the importance of protecting the environment. The study participants understood the health of the environment was linked to their current and future economic well-being. This shared vision helped the farmers collaborate and encourage each other to pursue the implementation of SWC practices.

The diagram below (Figure 5.1) summarizes the relationships between the dimensions of social capital and the themes derived from the analysis. Because formal and informal rules did not have a major impact in the study, it was not included in the diagram. To produce the figure, the connections between the derived themes and the social capital dimensions were explored. As previously discussed, the dimensions were found to be connected and work in tandem with one another to affect the adoption of SWC practices.

Figure 5.1 Relationship between final themes, social capital, and adoption



The following sections of this chapter discuss issues of generalizability and critical reflexivity. Recommendations for future research, practices, and policies in Kenya are also presented.

Addressing Generalizability

Case study research has been criticized for lacking generalizability (Flyvbjerg, 2006). Some qualitative researchers argue, however, that qualitative research should have its own criteria separate from the traditional definition of generalizability associated with quantitative methods. Maxwell (2013) states that the quantitative view of external generalizability is not directly applicable to most qualitative

settings. That is not to say that qualitative research cannot be applied to other settings, but generalizability is based on the applicability of the "theory of the processes" (Maxwell, 2013, p. 138). Baxter (2010), who prefers the term transferability instead of generalizability, agrees by advocating for theoretical generalization rather than statistical generalizability which is mostly associated with the quantitative approach. Rather than being based on statistical probability, transferability is concerned with whether explanations of how and why the phenomena occur in the research are credible (Baxter, 2010). Essentially, Baxter (2010) states that the goal of case study research is to understand why a theory does or does not fit the selected case.

The community of Merigi Ward is located in an area of high erosion where soil and water conservation practices are not highly utilized. It thus became of interest to understand how adopters in this area were influenced to use these practices and if social capital played any role in the adoption of erosion controls. Thus, the overall goal of this dissertation was to observe why and how social capital influences SWC practice adoption in Merigi Ward or why and how it does not.

While purposive sampling is often used by researchers, it is also seen to have limitations including the lack of generalizability (Berg & Lune, 2012). One of the goals, however, of purposive sampling is to select study participants or cases that are vital for understanding the theory that is driving a study (Maxwell, 2013). Thus, purposive sampling is helpful when the goal of the research is to understand phenomena that can't be observed through a representative sample of the population (Maxwell, 2013). The goal of this research is not to test the theory on a representative sample but to see how the theory works in a particular setting. It was important to observe the presence of social capital (if any) among adopters to explore the underlying theory that social capital may influence the adoption of soil and water conservation practices. The selected participants were as diverse as possible to strengthen internal generalizability and to make sure the way social capital was observed was credible.

I cannot speak to how common or unique the findings of this study are at this juncture. I advise that a wide scale study is conducted to further understand whether social capital has as strong an impact amongst other farmers in Merigi Ward and the upper Mara River Basin. I will discuss scaling up this research under the section “Recommendations for Research.” The farmers I interviewed in Merigi Ward, however, represent other smallholder farmers in communities in the upper Mara River Basin. This study may at least be generalized to smallholder farming communities in the upper basin.

Critical Reflexivity

In Chapter 3, I discussed that critical reflexivity could be used as a tool to help qualitative researchers better understand researcher bias and reactivity. Each evening after fieldwork, I practiced critical reflexivity by reflecting about the day and writing in a journal. One of the main things that featured multiple times in my entries was how my cultural background affected my ability to probe and prompt my interviewees. Even though I was not a part of the Kipsigis tribe, I felt that it was still expected of me to act "Kenyan," so to speak, and show respect even though it was across tribes. My own Kenyan cultural background demanded that I address elders with the utmost respect. As I wrote in my research diary, it was clear that my cultural background influenced the way I conducted my research. From what I was taught as a child, questioning the opinions or thoughts of elders is unacceptable. The entries in my journal reflected my tentativeness to probe some of my older interviewees or question their views to learn more lest I was deemed disrespectful.

This view, however, was false as many of my older study participants were not reluctant to share their opinions and experiences even those related to government inaction or issues of gender and land inheritance. As I spent more time with the farmers, I was able to drop the assumptions that I placed on the interviewees due to my own cultural upbringing and see each farmer, whether old or young, as

willing to share and be open. I began to trust that they would tell me if they felt uncomfortable and did not want to express their views.

Concerning reactivity, the one key advantage I had was being associated with my key informant. My respectful demeanor helped the participants feel comfortable talking to me, but without his presence I am not sure the study participants would have even agreed to be in the study. In general, however, I was still an outsider and throughout my fieldwork, I felt if I spoke the language and were a part of the same tribe, the interviewees could have been more open.

Overall, the main lesson I learned from conducting this research was the importance of being aware of my own cultural assumptions and separating my assumptions from those of my interviewees to allow them to truly tell their story.

Recommendations for Research

There is an opportunity to scale up the research conducted in this dissertation to understand the effect of social capital on SWC adoption on a larger scale within Merigi Ward or the upper Mara River Basin. A quantitative approach can be used to add breadth to the findings and explore relationships between variables. A survey to collect quantitative data can be developed based on the four dimensions of social capital and the interview questions used in this dissertation. Table 5.1 below provides examples of potential variables based on this study's social capital dimensions.

Table 5.1 Potential variables to be considered for future quantitative studies

Dimensions of Social Capital	Potential Variables
Groups & Networks	Memberships to groups
	Membership to a farmers' cooperative
	Types of SWC support from groups
	Types of SWC support from farmers' cooperative
	Types of services received from farmers' cooperative
	Level of activity in farmers' cooperative
Trust & Reciprocity	Feeling of Safety
	Presence of community/neighbor collaboration when facing problems
	Community/neighbor collaboration when implementing practices
	Frequency of exchange of knowledge/SWC materials
Formal & Informal Rules	Knowledge of governmental laws pertaining to SWC practices
	Implementation of government laws pertaining to SWC practices
Information	Access to context specific information vs. general information about SWC practices
	Sources of learning
	Preferred sources of learning

Some of the key findings of this study centered around the importance and value of peer-to-peer learning and access to context specific information. In a quantitative study, it would be of interest to decipher the types of information received (general information vs. context specific information); sources of learning (e.g. learning from other farmers or learning from extension staff); and preferred sources of learning to explore their relationships with SWC practice adoption. Additionally, characterizing the relationship between the types of services and support received by farmers from a farmers' cooperative and SWC practice adoption could be explored to further understand the influence of farmers' cooperatives and organizations.

In addition to adding breadth to this research, a qualitative longitudinal study would provide further insight to whether social capital continues to strengthen and influence SWC practice adoption amongst the study participants. A longitudinal study would be of particular interest in Merigi Ward as the support from the MaMaSe initiative will end.

Implications for Practice

Strong networks worked in favor of the farmers within Merigi Ward. High levels of trust and strengthened networks facilitated collaboration allowing farmers to help one another implement SWC practices and exchange information, materials, and experiences. Natural resource managers should capitalize on and strengthen the groups and networks already established within their community to build trust and capacity. Similarly, choosing the right group is crucial. The Merigi Farmers' Cooperative was a key partner in MaMaSe initiative programs in Merigi Ward. MFC was the largest farming oriented group and was essential to the dissemination of information. Natural resource managers should spend time understanding the groups in their community and their possible reach and capacities to aid in program and project goals.

Providing context specific information is vital. In terms of Merigi Ward, farmers were more able to take personalized information about erosion control practices and translate it on their own farms. While many communities and government agencies do not have the staff capacity to visit every farm providing personalized help and information, the MaMaSe initiative's peer-to-peer service provider model (see Chapter 4) can be adapted to help fill the voids left by extension staff whose capacities are stretched too thin. The service provider model also empowered the farmer's cooperative to take environmental conservation into its own hands. The farmers are then able to promote conservation using their already established networks.

Developing a shared vision amongst community stakeholders is important. With help from the MaMaSe initiative, all the study participants shared the perspective that environmental conservation was a necessary and important part of their future and thus the farmers are taking steps to tackle erosion. To work collectively, it is important for stakeholders to have shared goals and outcomes. I contend that in areas where social capital is low, a shared vision can be used as a building block to encourage collective action amongst stakeholders.

One of the largest impacts the MaMaSe initiative has had on the community's social capital is expanding networks (particularly bridging and linking capital) thus providing farmers with linkages to environmental experts and business opportunities. Natural resource managers should form partnerships across sectors to bring more resources into their communities or provide opportunities where the farmers can interact with potential buyers and services.

Policy Recommendations

Teshome et al., (2016b) suggest that the adoption of soil and water conservation practices include a "social dimension" (p. 223). The data presented in this dissertation supports Teshome et al., (2016b) and several scholars that suggest social capital is a factor that affects SWC practice adoption. The data in this dissertation has provided valuable insight into how social capital has helped the farmers of Merigi Ward adopt more sustainable practices and how an organization like the MaMaSe initiative can help build social capital.

Social capital is in every community and thus there is an opportunity to use it to improve natural resource management practices. The challenge is to identify how social capital works in a community and find ways to strengthen it so that it may become a positive and beneficial asset. As Kenya seeks to develop a National Soil Conservation Policy as per the 2013 National Environmental Policy, there is a prime opportunity to integrate social capital to promote the adoption of sustainable land practices.

Currently, the policy statements related to soil management in the 2013 National Environmental Policy remain broad:

> 1. Develop and implement a National Soil Conservation Policy.
> 2. Promote and support eco and organic farming so as to maintain soil fertility.
> 3. Ensure the protection of wetlands, riverbanks, hilltops, and slopes from unsustainable practices to prevent soil erosion and environmental degradation.
> 4. Promote good soil management practices to avert landslides, mudslides, floods and other disasters that are preventable.
> 5. Involve and empower communities in soil conservation.
> (Ministry of Environment, Water and Natural Resources, 2013, p. 18)

I would argue that prioritizing the fifth policy statement would have positive benefits on policy statements 2, 3 and 4. Referring to Chapter Two's discussion of the Community Capitals Framework and Emery & Flora's (2006) suggestion that social capital can increase the effectiveness of other capitals, it is clear from the data in this study that social capital has helped provide gains in natural capital in Merigi Ward. Based on the findings of this research, some recommendations for policies to be integrated into the National Soil Conservation Policy include:

- Governmental support for the establishment of farmer cooperatives or organizations at the ward level. Government policies should help the cooperatives build trust in their communities to recruit and maintain members. Strategies to achieve this include:
    - Funds to use for marketing and recruitment purposes.
    - Required training to provide leaders of cooperatives with improved business acumen of how to run and manage a cooperative.
    - Encourage a peer-to-peer learning model similar to that developed by SNV.
    - Assign a point person from extension services to work as a formal liaison between the cooperatives and the government.

- Promote collaboration between ward level farmers' cooperatives through forums to allow farmers to enhance bridging and linking capital by building connections and establishing business opportunities.
- Agricultural extension officers should be trained to understand the importance of social capital in soil conservation management with a mandate to strengthen social capital in their jurisdictions.
- The government should provide an environment that is amenable to the formation of public-private partnerships (P3s) to introduce additional resources into communities that government or agricultural extension is unable to provide. P3s should be required to include the strengthening of social capital as one of their main priorities.

Essentially, I contend that it is vital to prioritize social capital in policies related to soil and water conservation. With strengthened social capital, in all its forms, the capacities of communities are enhanced. They become armed with a collaborative spirit to improve the natural environment and their lives.

Reflections

While I was born and raised in Kenya, this study provided an opportunity for me to venture into a part of the country that I had never visited. I not only gained knowledge and research experience, I gained connections and friendships. A year after my data collection, I called my key informant to check up on him and the other farmers and our conversation was as if I never left. It is encouraging to know I would be welcomed back to Merigi Ward for a cup of tea as well as to conduct further research.

If I were to return to Merigi Ward, there are aspects of my study design I would change as well as topics I would be interested in exploring more. To address the language barriers I encountered, I would identify trained translators to help me with the participants who were more comfortable talking

in their tribal language. A trained translator may have helped provide more detailed translations thus providing more detailed insights. I would like to interview more women and explore gendered social capital as discussed by Njuki et al.'s (2008) study. Exploring the challenges faced by my female participants could have added further depth to my study. Lastly, a few of my older participants mentioned the past. They described how past relatives had used SWC practices but their use had faded away. I would have liked to spend some time learning more about the history of SWC practices and the changes that occurred in Merigi Ward.

My overall goal when starting this dissertation was to provide the Kenyan government and the community I worked in with practical solutions to help with the adoption of soil and water conservation practices. I wasn't expecting to receive anything in return but the farmers I met in Merigi Ward gave me renewed hope. I was surprised by the positivity I saw amongst the farmers I interviewed and their drive to improve environmental conservation on their farms and in Merigi Ward as a whole. Much of the time, Africa is portrayed in a grim light by the media. As an African, I think that the negative perceptions of Africa were somewhat exaggerated but I did begin to wonder whether Africa could get through some of the dire challenges it is facing. Through my research, however, I have seen that there are people who are engaged in bettering their communities. My research cemented my own belief that if the right resources are given to the right individuals in a community, positive change can occur.

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Appendix A - Smallholder Farmer and Key Informant Interview Schedules

Smallholder Farmer Interviews

Part One: Erosion and erosion control practices

1. Have you experienced soil erosion problems on your land?
    a. **Prompt:** Tell me about soil erosion on your land
    b. **Prompt:** Tell me about soil erosion in the community
    c. **Prompt:** Is erosion a major concern to you? And in the community? Why or why not

2. Tell me about your experience with erosion control practices?
    a. **Prompt:** Who introduced you to erosion control practices?
    b. **Prompt:** Types of erosion control practices used? With what crops? How extensive?

Part Two: Social capital characteristics and its relation to erosion control practices

3. Do you belong to any organizations? If yes, which ones?
    a. **Prompt:** Are all the organizations you belong to located in Bomet? If not, where are they located?
    b. **Prompt:** Which are the most important and why?
    c. **Prompt**: How did you get involved?
    d. **Prompt:** Has being a member of any of these organizations helped you implement erosion control practices? How?
    e. **Prompt:** What information, related to agriculture or the production of food, is available through your different networks and groups?
    f. **Prompt:** What are your preferred sources for getting information about erosion control practices? Why?

4. **Prompt:** Have you received or seen any information, related to agriculture or the production of food, produced by MaMaSe? If yes, what kind of information have you received or seen?
    a. **Prompt:** Can you tell me about a training day that you have attended? What did you learn? Who did you interact with? What would you have liked more information on?
    b. **Prompt:** Have you used any information from MaMaSe or things you have learned from MaMaSe trainings to implement erosion control practices? How so?

5. How do community members collaborate with one another in order to solve problems (including soil erosion) in the community?
    a. **Prompt:** If you experience an economic setback, such as crop loss, who do you turn to for help (beyond immediate family members)?
    b. **Prompt:** If a community project does not directly benefit you, but has benefits for many others in the neighborhood, would you contribute time or money to it?

c. **Prompt:** Do you collaborate with farmers from other Wards?
d. **Prompt:** Are there certain groups excluded from farming (e.g., women, young people etc.)?

6. Do know any national, regional, and/or local laws relating to erosion control practices? If so, which ones?
    a. **Prompt:** Have these laws affected your use of erosion control practices?

7. How safe do you feel in your community?

Part 3: The Future

8. What future do you envision for your farm?
    a. **Prompt:** Do you think you will keep living and farming on this land in the future?
    b. **Prompt:** Do you know who will take over your farm when you are unable to work the land?
    e. **Prompt:** Have you talked with other farmers about what you envision for your farm?
    f. **Prompt:** Has MaMaSe helped you think about the future of your farm?

Key Informant Interview – Additional Questions

9. Can you tell me more about the relationship in between the MaMaSe initiative and the Merigi Farmers' Cooperative?
10. Can you talk about some of the challenges facing people who are unable to adopt SWC practice?
11. Do you see any similarities between those farmers who've adopted these practices versus those who have not yet?

Appendix B - Smallholder farmer short survey questions

Name _____

*Please **circle** the appropriate response to each question and/or write out your response when directed.*

1. Age
   a. 18 – 34 years
   b. 35 – 44 years
   c. 45 – 54 years
   d. 55 – 64 years
   e. 65 years and over

2. Gender
   a. Male
   b. Female

3. What is your highest level of education completed?
   a. No schooling
   b. Primary school
   c. Secondary School
   d. College/University

4. What is your main source of income?
   a. Farming (selling farm produce)
   b. Livestock keeping
   c. Other (Please Specify) _____

5. How big is your household?
   a. 1 to 2 people
   b. 3 to 5 people
   c. 6 to 7 people
   d. 8 or more people

6. Ownership of the land you farm:
   a. Purchased
   b. Leased
   c. Other (Please Specify) _____

7. What is the size of your farm? (Please specify in hectares or acres) _____

8. How long have you farmed this land? _____ year(s)

9. What types of crops do you grow? (Please List)
   _____
   _____

10. Do you keep livestock on your land?
   a. Yes b. No

Appendix C - WWF and MaMaSe Initiative Staff Interviews

WWF Interview Schedule

1. Since WWF's arrival, what types of activities have been conducted within the basin?
    a. **Prompt**: how have the activities changed through time.

2. Through the years, what have been the major constraints to the adoption of SWC practices in the basin?

3. Since WWF began working in the Mara River Basin, have you seen any improvements to soil and water conservation practices in the basin? If so, what improvements have you seen?

4. What factors do you attribute the improvements (or the lack of improvements) in conservation practices to?

5. As a member of the MaMaSe Initiative, what is your role in the public-private partnership?

6. In your opinion, what are the successes of MaMaSe thus far and what challenges remain?

MaMaSe Staff Interview Schedule

1. Tell about the MaMaSe initiative
    a. **Prompt:** Describe the partners and their roles
    b. **Prompt:** Describe the goals/objectives of the MaMaSe initiative
    c. **Prompt:** How did you enter the Merigi Community

2. Was the community receptive to the MaMaSe initiative and its programs?

3. What types of activities or programs do you conduct within the basin?
    a. **Prompt:** Tell me about the exhibition that took place in Kembu

4. How would you characterize the quality of community participation in this organization?
    a. **Prompt:** Do any groups within the community feel excluded from the organization? What groups are they?

5. In your opinion, what are the successes of MaMaSe Initiative thus far and what challenges remain?

Appendix D - List of Codes

The following list features the codes derived from the data analysis. The list includes the name and type of code followed by its description.

ALLOW THAT WATER TO ENTER THE FARM
In vivo code.
A participant explained that the government sometimes doesn't do what is in the best interest of their citizens. Government entities have built ditches in the ward that flow directly onto farms, leaving the farmer to deal with the runoff without any compensation or assistance. Passages related to government activities that have had adverse effects on soil conservation efforts were coded to this code.

ALMOST EQUAL
In vivo code.
Many interviewees stated that the groups in their life are of equal importance. They all offer something valuable. Furthermore, the study participants stated that the discussions held at different group meetings are similar. They discuss issues related to the community which include farming and soil conservation. Passages referring to the equal importance of groups were coded to this code.

BADNESS OF SOIL EROSION
In vivo code.
When I asked a participant whether she had experienced erosion, almost immediately she mentioned that soil is erosion is a problem by using the phrase “the badness of soil erosion." Although this is a translation of the Kipsigis language, I think the phrase shows that erosion is perceived negatively, as if it is like a sickness. Passages referring to the detrimental effects of erosion were coded to this code.

BANANAS
Descriptive code.
This code collects information related to planting bananas as a soil conservation measure.

BE A LITTLE BIT STABLE
In vivo code.
Amongst the interviewees, there is an understanding that implementing soil and water conservation practices will lead to a better future and economic stability. Passages that discussed a more stable future with improved soil and water conservation practices were coded to this code.

CALL EACH OTHER, THEY DISCUSS
In vivo code.
Community members lean on one another and come together to discuss community issues. The phrase "call each other" indicates that the community rely on collaboration to solve problems. Passages related to coming together to discuss community issues were coded to this code.

CANNOT SUCCEED ALONE
In vivo code.
Study participants acknowledged that there is a need to share information and collaborate with one another for the better of the community. Information is important and it needs to be spread amongst

the entire community in order to move forward. Passages related to working together and sharing information were coded to this code.

CAPACITY BUILDING
In vivo code.
The MaMaSe initiative focused on strengthening local institutions. Educating the Merigi Farmers' Cooperative leadership and giving them tools to help the community around them was a major strategy or approach. Passages where farmers discuss capacity building through the MaMaSe initiative are coded to this code.

CARRIES THE SOIL
In vivo code.
This code shows the perception and understanding of erosional processes. Passages where farmers discussed the movement of soil were coded to this code.

CHURCH GROUP
Descriptive code.
Collects information on church groups.

COME SEVERAL TIMES
In vivo code.
The MaMaSe initiative has been a constant in the lives of the farmers interviewed. MaMaSe initiative staff have had continuous interactions with the farmers in a variety of different ways. Passages related to farmers discussing their interaction with MaMaSe initiative programs and staff were coded to this code.

CONSERVATION OF ENVIRONMENT
In vivo code.
The MaMaSe initiative strived to instill the value of conservation in the minds of the farming community. Many of the study participants perceive conservation as a major and vital part of their lives in the present and in the future. The MaMaSe initiative seems to be at the root of this view, especially when it comes to the future. Passages related to study participants talking about the importance of environmental conservation were coded to this code.

CONTINUES TEACHING
In vivo code.
A few study participants stated that they looked forward to continual support from the MaMaSe initiative. Codes related to participants discussing future support from the MaMaSe initiative were coded to this code.

CONTOURS
Descriptive code.
Collects information on contour farming.

COOPERATIVE AS A LINK
In vivo code.
The Merigi Farmer's Cooperative acts as a link to other organizations, government entities and services to provide additional resources to their community. They facilitate bridging capital to other

organizations, particularly, the MaMaSe initiative. Being a member of the cooperative provides farmers with resources (information and assistance) from within and outside of their community. Passages that discuss how the cooperative acts as a connection to other services are coded to this code.

COOPERATIVE IS BIGGER
In vivo.
This code represents the importance of the Merigi Farmers' Cooperative and the role it plays in the community. Passages related to the importance of the cooperative are coded to this code.

CROPS ARE ALSO SWEPT BY THE WATER
In vivo code.
This code comes from farmers describing how the seasonal rains they experience can sweep away their crops. The code represents the devastation of uncontrolled runoff on their farms. Passages related to losing crops from strong rains and runoff were coded to this code.

DESMODIUM
Descriptive code.
Collects information on the use of desmodium as an erosion control measure.

DID NOT ATTEND
Descriptive code.
This code shows those who were unable to make it to the MaMaSe initiative market event held earlier in the year and/or have never participated in MaMaSe initiative programs.

DIFFERENT AVENUES
In vivo code.
There are different avenues that one can take to address issues that are present in the community. Passages where farmers discuss multiple options for solving problems were coded to this code.

DIVERSIFICATION
In vivo code.
This code represents the farmers that have chosen to diversify the crops and activities on their farm. With improved conservation measures farmers have faith they will be able to do more on their farms. They believe in their farms and there is a positive outlook towards the future. Passages that relate to farmers discussing their future plans to improve and increase the number of activities on their farms were coded to this code. This code is similar to "NEW DEVELOPMENT."

DOUBLE WORK
In vivo code.
A large number of participants discussed the benefits of napier grass. It does double the work by controlling erosion and producing fodder for animals. Passages where farmers mention the importance of napier grass and the double benefits were coded here.

ENCOURAGING EACH OTHER
In vivo code.
Many study participants explained that they encourage each other to continue using soil conservation measures or encourage each other to adopt. Passages related to instances where farmers actively

encouraged others to adopt soil and water conservation practices or become more environmentally conscious are coded under this code.

EXCHANGE EXPERIENCE
In vivo code.
Through MaMaSe initiative activities such as seminars, market events, field days, and training sessions, farmers were exposed to people from other areas and were able to exchange experiences and knowledge (reciprocity) with each other. These programs also created an environment where people could learn from each other. Passages related to exchanging experiences with other farmers are coded under this code.

EXCHANGE GOODS
In vivo code.
Study participants stated that they also interacted with other farmers and people through the market. Passages related to exchanging goods in the market were coded to this code.

FEELS SAFE
In vivo code.
All study participants stated they generally felt safe in their community. Passages related to safety were coded to this code.

FINANCIAL SUPPORT
In vivo code.
Study participants discussed that financial limitations can make it hard to implement some of the erosion practices that they need. For example, a few farmers explained that paid labor is needed to dig trenches and build zero grazing units. Passages that pertain to the financial needs of farmers were coded to this code.

FOOTPATHS
In vivo code.
Footpaths are used to transport livestock to and from water sources. The footpaths are a major source of erosion and one of the main issues facing the community. The mention of footpaths and their associated problems were coded to this code.

FORCED TO PLANT NAPIER
In vivo code.
A study participant described that erosion had become so bad, she was forced to implement some measures to alleviate the problems. Erosion could not be ignored and something had to be done. Passages where participants described they had no choice other than to use erosion controls were coded here.

FROM OTHER PLACES
In vivo code.
This code represents instances where the study participants have connections to farmers from other areas (thus documenting bridging capital) whether through personal initiative or through MaMaSe programs. Passages related to these situations were coded here. Similar codes include: “EXCHANGE EXPERIENCE” and “EXCHANGE GOODS.”

GENERATE SOME INCOME
In vivo code.
This code is similar to the "BE A LITTLE BIT STABLE" code. Farmers recognized that soil conservation leads to improved yields and improved incomes. Passages related to improving incomes through better farm practices were coded to this code.

GIVEN US
In vivo code.
The MaMaSe initiative has not only provided context specific information and training sessions, but has provided other necessary things like materials (i.e. seeds) and financial capital. Study participants were aware and grateful of all the things they had received from the initiative. Passages where farmers mentioned the resources they received from the MaMaSe initiative were coded to this code.

GOOD MANAGEMENT
In vivo code.
The MaMaSe initiative has also provided training in farm management to help farmers understand what it takes to run a successful farm. Passages where farmers discuss learning about farm management are coded to this code.

GOVERNMENT IS NOT HAPPY
In vivo code.
This code represents the government's dissatisfaction with high erosion rates. The farmers understand that erosion is a problem not only at the community level but at the national level and the government has regulations to reduce erosion. Passages where the farmers expressed an understanding that the government has a need to curb erosion were coded to this code.

GOVERNMENT IS PROVIDING SECURITY
In vivo code.
Contrary to most of the discussions, some participants believes that there is adequate security from the government. Passages where farmers discuss satisfactory government security are coded to this code.

GRASS & FALLOW
Descriptive code.
Collects passages related to the use of grass strips for erosion control and fallow land.

GREATLY ASSISTED
In vivo code.
Gratitude towards the MaMaSe initiative was felt among several farmers. Farmers were particularly grateful for the information they have received. Passages where study participants discuss how they have been helped by the MaMaSe initiative were coded here.

HAS A GOOD FARM
In vivo code.
Passages where farmers believed in the value of their farm and the potential it has for future production were coded to this code.

HELP EACH OTHER
In vivo code.
All study participants are willing to help one another and have supported others in some way. The farmers rely on each other for support and assistance. Passages where farmers stated they volunteer their time or resources to others were coded to this code.

HELPED HIM PLAN
In vivo code.
With the help of the MaMaSe initiative, the farmers are now better able to plan for the future. Passages where study participants discuss how the MaMaSe initiative has helped them plan for the future are coded to this code.

HELPED IN IMPLEMENTATION
In vivo code.
The Merigi Farmers' Cooperative provides help with the implementation of erosion control practices. Through the cooperative, members receive assistance that they would not have had otherwise. Passages where farmers discuss implementation support for the Merigi Farmers' Cooperative are coded to this code.

IDEA SHARING
In vivo code.
Passages where farmers discuss interactions where there is an opportunity for an exchange of ideas are coded here. This code represents reciprocity. Similar codes include: "EXCHANGE EXPERIENCE" and "FROM OTHER PLACES."

IDLERS
In vivo code.
While participants see the community as safe, there are those who may steal from other farms due to lack of income and the realities of poverty. Passages relating to farmers discussing the link between unemployment and crime are coded to this code.

IMPLEMENTING
Process code.
This code collects passages where farmers discuss implementing SWC practices. The study participants have a network of support which aid in the learning and implementation of SWC practices.

IMPORTANCE OF THESE GROUPS IN HELPING ONE ANOTHER
In vivo code.
Through groups many of my study participants have access to resources to help them when they are in need. Groups play an important role when it comes to receiving support. For example, farmers can turn to their groups for money to help pay for their children's school fees. Any mention of groups and their benefits were coded to this code.

IMPROVE PRODUCTIVITY LEVEL
In vivo code.
Many study participants are looking to improve their farm productivity levels in the future. Passages related to increased yields to support livelihoods in the future were coded to this code.

INDIVIDUAL EFFORT
In vivo code.
While community members generally support one another, it seems that most have not come together to plan for the future in terms of soil conservation practices. Most farmer's plans are closely held within the family unit. Passages where farmers discussed that they have not coordinated their conservation efforts with other farmers were coded to this code.

INFORMATION ABOUT AGRICULTURE
Descriptive code.
Collects passages where farmers discuss learning about agriculture and soil and water conservation from different entities such as the Merigi Farmers' Cooperative, community members, government and/or organizations like the MaMaSe initiative.

INTERACTING WITH OTHERS
Process code.
Passages where farmers discuss their interaction with other farmers within and outside Merigi Ward were coded here.

INVEST IN OUR CHILDREN
In vivo code.
All participants stated that their children will take over the farm in the future. Thus, many participants saw investing in their children as an important part of their farm plans. The farmers are investing in their children's education so that the children are more able to take care of the farm. Passages related to educating and investing in children for the future were coded to this code.

INVITING US & WE ARE INVITING THEM
In vivo code.
Some study participants discussed collaborations between themselves and farmers from other wards. Passages where farmers mention they collaborate regularly with people outside of Merigi Ward were coded to this code.

KEEPING THE DAIRY ANIMALS
In vivo & process code.
Keeping dairy animals is important to many of the farmers as they are a source of food and income. Any mention of rearing livestock for milk production was coded to this code.

KIPSIGI TRIBE
In vivo code.
Tribal affiliation contributes to the bonding capital within the community. Tribe connects people through language and custom (and sometimes even the way people look). The Kipsigis tribe seem to be tight nit. Passages where farmers mention being a part of the Kipsigis tribe was coded to this code.

LAG BEHIND
In vivo code.
Though community collaboration is strong within Merigi Ward, there are still people that generally "lag behind" and don't willingly participate in community activities. Any mention of the lack of community involvement by some members of the community were coded to this code.

LAWS HELP
In vivo code.
In general, most of the study participants didn't seem to be hampered by any soil conservation laws or rules. Though lacking in depth, soil conservation laws provided some guidance. Passages where farmers stated they found national soil conservation laws helpful were coded to this code.

LEARNING
Process code.
Passages where farmers discussed learning about soil conservation practices were coded to this code. Farmers were actively learning from staff members of various organizations, agricultural extension, and from one another.

LEAVE A LEGACY
In vivo code.
This code collects passages where farmers discuss the legacy they want to create through farming. The code relates to "WON'T MOVE ANYWHERE" as it indicates a sense of permanency and the fact that most study participants are not planning to leave their farms. The study participants expect their farms to be around for generations to come. Similar codes include "PROSPEROUS FUTURE."

LOCAL ORGANIZATIONS
In vivo code/descriptive code.
When asked about soil conservation laws, some participants stated they relied on soil conservation guidelines from local organizations, including the MaMaSe initiative. Passages where farmers learn of soil conservation guidelines from local organizations were coded to this code.

MARKET DRIVEN MEASURES
In vivo code.
One of the priorities of the MaMaSe initiative is to help farmers satisfy market demands. The initiative not only encourages environmental conservation but expects farmers to make a living and sell their produce to satisfy the market. Passages where farmers discussed the need to meet market demands were coded to this code. Similar codes include "THAT MARKET OUTSIDE THERE" and "MARKETS HIS MILK."

MARKETS HIS MILK
In vivo code.
Many farmers talked about the need to market and sell their milk for profits. The Merigi Farmers' Cooperative became a place where farmers could sell their products. Discussions related to the need to market their milk products were coded here.

MERIGI COOPERATIVE
Descriptive code.
Passages related to the Merigi Farmers' Cooperative were coded to this code. Sub-codes were used to organize the information within this code.

MERIGI INTEGRATED DEVELOPMENT
Descriptive code.
Passages related to the Merigi Integrated Development Project (a community based organization) were coded to this code. Sub-codes were used to organize the information within this code.

MERIGI VISION GROUP
Descriptive code.
Collects information related to the Merigi Vision Group, a community based organization. Sub-codes were used to organize the information within this code.

MERRY-GO-ROUND
In vivo code.
A "merry-go-round" is one of the main forms of collaboration that the study participants used to provide financial assistance to one another. Everyone pitches in a little money here and there to help people send their children to school or help pay hospital bills. A “merry-go-round” demonstrates strong bonding capital within the community. These groups seem to be made of up members from specific villages. Discussions related to “merry-go-rounds” and their benefits were coded to this code. This code also refers to other forms of communal fundraising, though the most common form mentioned by study participants is the merry-go-round system.

MIGHT SHARE
In vivo code.
Though the farmers stated they are willing to share or are ready to share their conservation plans with others, most have not. There is still a sense that the farmers what to keep their plans within the family. Passages related to farmers discussing their willingness to share were coded to this code. This code is similar to “INDIVUAL EFFORT.”

MIXED GROUP
Descriptive code.
Collects discussions related to mixed gender groups.

MORE INFORMATION
In vivo code.
This code refers to the fact that the MaMaSe initiative provides information that is tailored to the individual farmer. The code represents the improved soil conservation guidelines the initiative provides. Discussions where farmers indicate they received better or more detailed information from the MaMaSe initiative are coded to this code.

MORE MILK
In vivo code.
All study participants own and rear livestock, particularly, dairy animals. Most farmers were concerned with increasing milk production and saw the use of napier, an additional source of fodder, as a way to boost milk production. Passages that mention increasing milk production are coded to this code. Similar codes include “IMPROVE PRODUCTIVIY LEVEL” and “DOUBLE WORK.”

MY SONS
In vivo code.
Gender plays a role in the inheritance of the farms. According to my study participants, in the Kipsigis culture, sons inherit the land. Daughters may inherit part of the land if they remain unmarried. Passages where farmers discuss gender norms are coded to this code.

NEW DEVELOPMENT
In vivo code.
A few farmers mentioned they would like to begin new developments or activities on their farm. This code indicates that people are looking to expand their activities in anticipation that farming will bring more prosperity. Passages where farmers mention new activities on their farm were coded to this code. Similar codes include “PROSPEROUS FUTURE” and “DIVERSIFICATION.”

NOT INTERFERED WITH IN HER DAILY ACTIVITIES
In vivo code.
One participant stated that there are no safety concerns that interfere with her day to day activities. This was a key point, however, that relates to the “SECURITY IS PARAMOUNT” code. To focus on bettering their lives, a safe environment is vital.

NOT TOLD ANYBODY
In vivo code.
While there is a collective understanding of the importance of the environment, most farmers have not shared their future conservation plans with other farmers. As a suggestion, I think it is important for farmers to coordinate the implementation and construction of SWC practices across farms so that the community as a whole can benefit. Passages where farmers stated they had not shared their future plans with others were coded to this code.

OLD STRUCTURES
In vivo code.
Three study participants mentioned that their farms had old erosion control structures that past relatives had put in place in the past. The old structures harken back to a time where there seemed to be widespread use of erosion control measures. This code relates to the code “REVIVAL.”

ONLY PROBLEM IS IMPLEMENTATION
In vivo code.
Some study participants stated that government programs related to erosion control have not been successful because soil conservation laws have not been enforced effectively. This code represents farmer perception of the government. Most study participants believed government workers are stretched too thin and do not have the capacity to implement the laws and policies that are in place. Passages where the farmers discussed lack of government enforcement were coded to this code.

ONLY WITHIN THE WARD
In vivo code.
While some participants have collaborations outside of Merigi Ward, three farmers mentioned they only had ties within Merigi.

ORGANIC FERTILIZER
Descriptive code.
Collects passages where farmers mention the use of organic fertilizer.

OTHER PEOPLE CAME
In vivo code.
“Other people came” was the phrase used when the farmers couldn't remember the name MaMaSe or WWF. But they knew organizations had come into the community to assist them. In one instance, a

farmer pulled out a tote bag with the MaMaSe initiative logo on it so she could tell me which organization she was discussing. The phrase also acknowledges that the staff of these organizations were considered "outsiders." Passages where farmers were unable to recall the name of the organizations were coded to this code.

PERSONNEL NOW, IS AN ISSUE
In vivo code.
This code is related to the "ONLY PROBLEM IS IMPLEMENTATION" code. Study participants mentioned that government services are limited because of the lack of government staff, particularly, in terms of agricultural extension and security. Passages where farmers discuss limited services related to lack of government staff were coded to this code.

PLANTING OF NAPIER GRASS
In vivo & process code.
The mention of napier grass features quite prominently throughout the interviews. Napier grass is used for erosion control and fodder. Passages related to the planting of napier grass were coded to this code. Similar codes include: "DOUBLE WORK" and "FOCRCED TO PLANT NAPIER."

POVERTY CAN BRING ABOUT THE ISSUE OF INSECURITY
In vivo code.
Poverty can bring about insecurity in a community. Those who are struggling in life may steal from others in order to survive. Passages where farmers mentioned poverty as a cause of crime were coded to his code. This code relates to "IDLERS."

PROSPEROUS FUTURE
In vivo code.
Most of the study participants believe that their future is bright. The interviewees stated that if they continued with what they have learned from the MaMaSe initiative and continued to implement soil erosion controls they will have success in the future. Any mention of continuing sustainable farming practices and success in the future were coded to this code.

PUBLIC BARAZAS
Descriptive code.
Community collaboration is facilitated through meetings. When there is a problem, community members come together to discuss and find solutions. Public "barazas" or public meetings are one way community members come together to address issues. Passages where farmers discuss public meetings or "barazas" were coded to this code.

READY TO SHARE
In vivo code.
Similar to the "MIGHT SHARE" and "NOT TOLD ANYBODY" codes, farmers are not actively sharing their future conservation plans but some farmers stated that they are willing to share their plans if asked. Passages where farmers indicate they are willing to share their conservation plans or see the importance of sharing plans were coded to this code.

RECEIVING IS FROM THE COOPERATIVE
In vivo code.
This code represents the major role the Merigi Farmers' Cooperative (MFC) plays in the dissemination of information. The cooperative is an important part of the information chain among those who were interviewed. Passages where farmers indicate they receive information from MFC were coded to this code.

REMAIN WITH NOTHING
In vivo code.
Farmers noticed that widespread erosion causes a decrease in crop yields. This code relates to the "SOIL WAS BECOMING INFERTILE" code and discussions surrounding the loss of soil fertility. Passages where farmers discussed lower crop yields were coded to this code.

REVIVAL
In vivo code.
A few participants mentioned erosion control was more widespread in the past – particularly during the 1970s – but had since lost momentum. In more recent times, however, one study participant credited the government, WWF and the MaMaSe initiative for instigating a "revival" of soil conservation practices.

ROLE MODEL
In vivo code.
Four study participants stated that it is important to be a role model to other farmers in the community. They wanted to demonstrate what can be done to reduce erosion so that others can follow. Passages where farmers discuss being a role model are coded here. This code is similar to "SHOWS BY DOING."

ROOFS OF THE BUILDINGS
In vivo code.
Man-made structures contribute to impervious surfaces and add to the amount of runoff affecting the farms in Merigi Ward. Passages where farmers indicate that man-made structures have contributed to erosion problems were coded to this code.

RUNOFF FROM THE ROAD
Descriptive code.
Another major source of runoff is the roads that wind through Merigi Ward. Runoff from the roads affect the farms quite severely if the runoff is not controlled. Passages where farmers indicated that they had been affected by runoff from roads were coded to this code.

SAME MESSAGE
In vivo code.
Some farmers indicated that the information they receive from their various groups is similar. Most of the groups emphasize the importance of the environment and its link with well-being. Passages where study participants discuss the similar messages they've received from their groups were coded to this code.

SCHOOL EXPERIENCE
In vivo code.
Two farmers indicated that they were introduced to SWC practices through formal education.

SCHOOL
Descriptive code.
Collects information on participants who belong to school groups.

SECURITY IS PARAMOUNT
In vivo code.
This code represents the view that security is vital. If you don't have to worry about your family's safety, it is possible to turn your attention to other things like environmental conservation. Passages where study participants discussed the importance of safety and security were coded to this code.

SEE THE BENEFITS
In vivo code.
Passages where farmers have witnessed the benefits of soil and water conservation practices were coded to this code.

SEEN IT WITH MY VERY EYES
In vivo code.
Many of the farmers have seen or witnessed the devastation of erosion. Passages where farmers described personal experience with soil erosion and its detrimental effects were coded to this code.

SHOWS BY DOING
In vivo code.
This code is similar to "ROLE MODEL." Passages where farmers mentioned they promoted soil and water conservation by leading by example were coded to this code.

SLOPING LAND
Descriptive code.
Passages where the study participants discussed the hilly topography of the area were coded to this code. Most farmers also described the link between the topography of the land and erosion.

SOCIAL BARRIERS
In vivo code.
My key informant discussed that there are social aspects and barriers that affect the use of erosion control practices. For example, he explained that sometimes people can equate implementing soil conservation practices with a higher social status. That is, once a person implements soil and water conservation practices you are seen to have a higher social status compared to those who have not adopted.

SOIL WAS BECOMING INFERTILE
In vivo code.
Most farmers saw a decrease in crop production as a result of erosion. Passages where farmers discuss soil infertility and erosion were coded to this code. This code is similar to "REMAIN WITH NOTHING."

SOURCE OF RULES
Descriptive code.
Collects passages where study participants discuss the soil and water conservation laws they are aware of.

SUB-CATCHMENT AREA
Descriptive codes.
Collects information from study participants who belong to sub catchment environmental groups.

SWEET POTATO VINES
Descriptive code.
Collects discussions related to the use of sweet potato vines.

TAUGHT ME
In vivo code.
The MaMaSe initiative and other partners play the role of “teacher” to many of the farmers. They impart helpful knowledge and so their participants feel like they are learning something. Passages where farmers discuss receiving “teachings” from the MaMaSe initiative and others are coded to this code.

TEA
Descriptive code.
Collects information about the use of tea as a cover crop.

TELLING
Process code.
Passages where farmers discuss the exchange of soil and water conservation knowledge or information amongst themselves were coded to this code.

TEND TO PROTECT OURSELVES
In vivo code.
The phrase "tend to protect ourselves" gives a sense of the strong ties between community members. Passages related to protecting and supporting each other (in terms of safety) were coded to this code.

THAT MARKET OUTSIDE THERE
In vivo code.
Study participants understand that their products can satisfy market demands. See codes “MARKET HIS MILK” and “MARKET DRIVEN MEASURES.”

THE POLICY IS THERE
In vivo code.
Most of the interviewees recognized that there are government laws pertaining to soil conservation. Passages where the farmers mention and describe soil conservation laws were coded to this code.

THEY HAVE SOME CONSULTANTS
In vivo code.
The MaMaSe initiative has helped connect the farmers of Merigi Ward with environmental experts and consultants, thus facilitating bridging and linking capital. Passages where farmers mention interacting and forming connections with MaMaSe initiative consultants were coded to this code.

THOSE WHO DON'T CARE ABOUT IT
In vivo code.
Though I interviewed adopters, some study participants mentioned there are also people who do not "care" about erosion control. Passages where farmers discussed those who do not adopt soil conservation practices were coded to this code.

TO MAKE WORK EASY
In vivo code.
Passages where farmers discuss working collaboratively to share resources and labor so that life can be easier were coded to this code. Similar code: “MERRY-GO-ROUND.”

TRASHLINES
Descriptive code.
Collects passages where farmers discuss the use of trashlines as an erosion control measure.

TRENCH AND TERRACES
Descriptive code.
Collects passages where farmers discuss the use of trenches and terraces as erosion control measures.

UNLESS WE COME TOGETHER
In vivo code.
Amongst most of the farmers, there is an understanding that each and every person has to do their part in order to protect the environment. Passages where farmers discuss collaborating for the sake of the environment are coded to this code.

VILLAGE ELDER AND CHIEFS
In vivo code.
Within the community, village elders and chiefs play an important role in facilitating collaboration. Passages where farmers discuss the role of village elders and chiefs were coded to this code.

VILLAGE GROUP
Descriptive code.
Collects passages where farmers discuss being a member of a village group.

VOLUNTEER SERVICE
In vivo code.
Much of the work done by the officials of Merigi Farmers’ Cooperative is conducted on a volunteer basis. Discussions related to volunteering at the cooperative were coded to this code.

WE ALL PARTICIPATE
In vivo code.
This code reflects that there is no intentional exclusion of people when it comes to community collaboration. Anybody who is willing to work on communal activities is welcomed. Discussions related to community inclusion were coded to this code.

WE ARE SHARING THE STREAM
In vivo.
This code is similar to “UNLESS WE COME TOGETHER.” Some of the study participants discussed that natural resources are shared by everyone and if one person acts unsustainably then the entire community is affected. Passages where farmers discuss the need for every individual to practice environmental conservation for the sake of the entire community were coded here.

WHEN IT RAINED
In vivo code.
Passages where farmers discussed the link between heavy rains and exacerbated erosion were coded to this code.

WOMEN'S GROUP
Descriptive code.
Collects discussions where farmers indicate they belong to a women’s group.

WON'T MOVE ANYWHERE
In vivo code.
This code represents the views of most of the study participants. They see themselves living on the land well into the future and handing down their farm to the next generation. Passages where farmers indicated they would stay on their land for the foreseeable future were coded to this code.

WOODLOT
Description code.
Collects discussions related to the use of trees for erosion control.

ZERO GRAZING
Descriptive code.
Collects passages where farmers describe zero grazing activities.

Appendix E - Ethical Approvals

Kansas State University Ethical Approval

KANSAS STATE UNIVERSITY | University Research Compliance Office

TO: Tim Keane
LARCP
216 Seaton

Proposal Number: 8186

FROM: Rick Scheidt, Chair
Committee on Research Involving Human Subjects

DATE: 03/17/2016

RE: Proposal Entitled, "Understanding the Adoption of Soil and Water Conservation Practices in the Mara River Basin, Kenya"

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written – and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §46.101, paragraph b, category: 2, subsection: ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

203 Fairchild Hall, Lower Mezzanine, 1601 Vattier St., Manhattan, KS 66506-1103 | 785-532-3224 | fax: 785-532-3278 | k-state.edu/research/comply | comply@ksu.edu

Egerton University Ethical Approval

EGERTON UNIVERSITY

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RESEARCH ETHICS REVIEW COMMITTEE

EU/RE/DVC/009 **10th May, 2016**

Elizabeth M. Musoke,
1917 Anderson Ave APT DI
NATHANTTAN KS 66502-7801

RE: APPLICATION FOR ETHICAL APPROVAL OF RESEARCH PROJECT

Reference is made to your application for Ethical clearance of your Research Project entitled: "***Understanding the Adoption of Soil and Water Conservation Practices in Mara River Basin, Kenya***". The Egerton University Research Ethics Committee met on Wednesday 4th May, 2016 and discussed the protocols of research in your proposed study.

It was observed:

- That the research is a survey and therefore it is not intrusive,
- That the confidentiality protocol has been explained sufficiently,
- That the procedure to ensure confidentiality of information has been explained,
- That the consent form was clear and adequate in content.

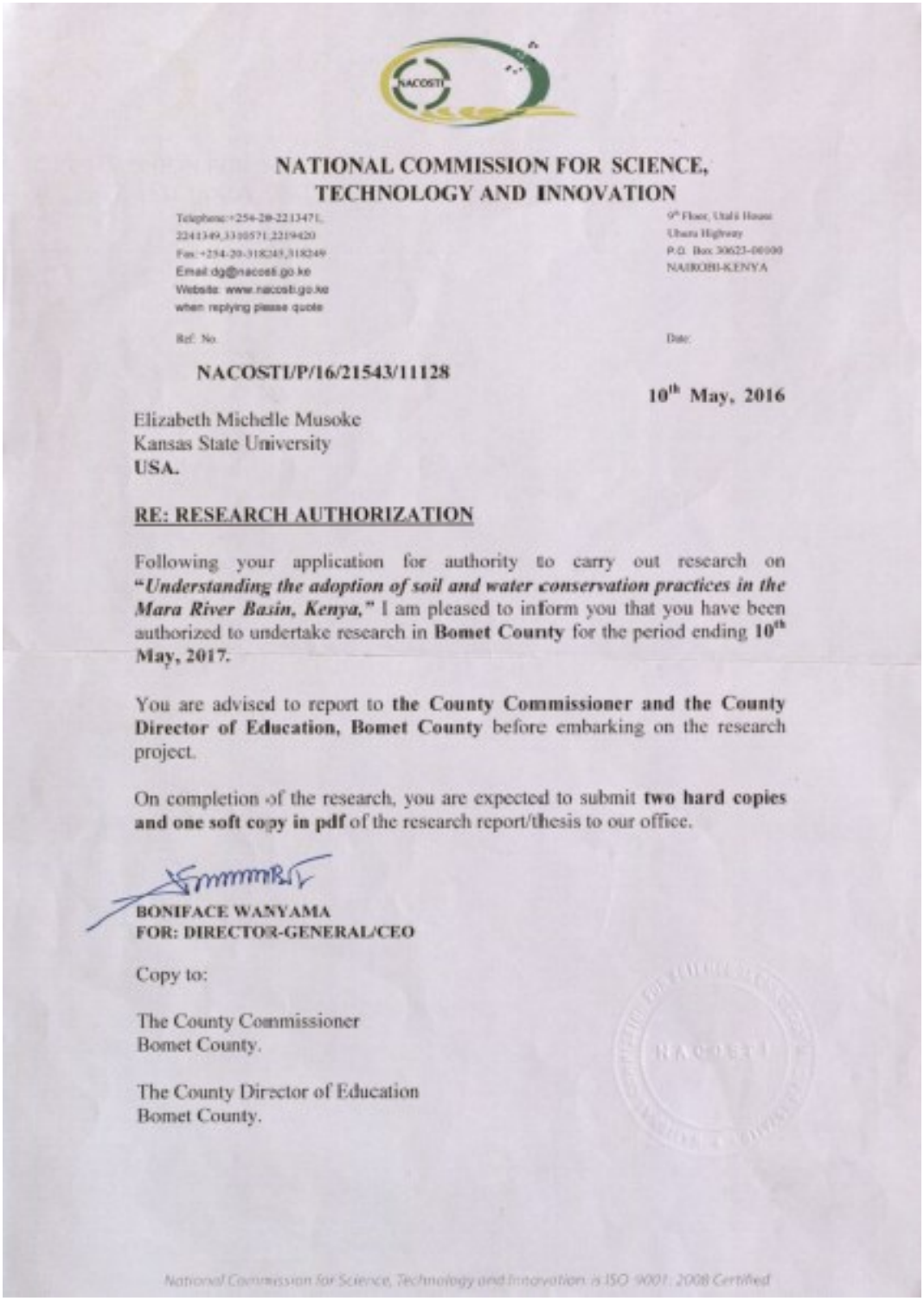
Your proposed study was approved for implementation. You are however required to apply for a Research permit from the National Council of Science and Technology (NACOSTI) and to fill an affiliation form. The application process is online and you can access by visiting NACOSTI website using the address: oris.nacosti.go.ke.

Please also note that our Standard Operating Procedures require that you submit progress reports and a final report upon completion of your study.

Prof. J. K. Kipkemboi
CHAIRMAN – RESEARCH ETHICS COMMITTEE

JKK/ejc

Kenyan Government Approvals



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

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NACOSTI/P/16/21543/11128

Date:

10th May, 2016

Elizabeth Michelle Musoke
Kansas State University
USA.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Understanding the adoption of soil and water conservation practices in the Mara River Basin, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Bomet County** for the period ending **10th May, 2017.**

You are advised to report to **the County Commissioner and the County Director of Education, Bomet County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

BONIFACE WANYAMA
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Bomet County.

The County Director of Education
Bomet County.

National Commission for Science, Technology and Innovation is ISO 9001: 2008 Certified

OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR AND COORDINATION OF NATIONAL GOVERNMENT

Telegrams: "DISTRICTER", Bomet
Telephone: (052) 22004/22077 Fax 052-22490
When replying please quote

COUNTY COMMISSIONER
P.O BOX 71
BOMET - 20400

REF: EDU 12/1 VOLI (167)

18th May, 2016

All Deputy County Commissioners
Bomet County

RE: RESEARCH AUTHORIZATION – ELIZABETH MICHELLE MUSOKE

The above named person has been authorized to carry out research on "Understanding the adoption of soil and water conservation practices in the Mara River Basin, Kenya," in Bomet County for a period ending 10th May, 2017 by the National Commission for Science, Technology and Innovation.

Any assistance accorded to her would be appreciated.

COUNTY COMMISSIONER
BOMET COUNTY

Henry Metto
For: County Commissioner
BOMET COUNTY

c.c.

Elizabeth Michelle Musoke
Kansas State University
USA.

REPUBLIC OF KENYA
MINISTRY OF EDUCATION SCIENCE AND TECHNOLOGY
State Department of Education

Telegrams: "ELIMU",
Telephone: 052-2226
Email:cdebometcounty@gmail.com

When replying please quote
REF: CDE/BMT/AUTH/VOL.1/42

COUNTY DIRECTOR OF EDUCATION
BOMET COUNTY
P.O.BOX 3-20400
BOMET

18TH MAY, 2016

ELIZABETH MICHELLE MUSOKE
KANSAS STATE UNIVERSITY,
P.O BOX 536-20115,
USA.

RE: RESEARCH AUTHORIZATION:

Reference is made to the letter dated 10th May, 2016 NACOSTI/P/16/21543/11128. The above mentioned person is hereby authorized to carry out research on ***"Understanding the adoption of soil and water conservation practices in the Mara River Basin, in Kenya,"*** for the period ending **10th May, 2017.**

This Office has no objection towards the same. Kindly grant her the assistance she requires.

COUNTY DIRECTOR OF EDUCATION
BOMET COUNTY
P.O. BOX 3-20400,
BOMET.

WILLIAM SUGUT
COUNTY DIRECTOR OF EDUCATION
BOMET COUNTY